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Designing for dementia : an assessment of the impact of the physical environment on wayfinding success for residents in long term care settings

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**Designing for Dementia:
An Assessment of the Impact of the
Physical Environment on Wayfinding
Success for Residents in Long Term Care
Settings**

Thesis submitted for the degree of
Doctor of Philosophy

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Bachelor of Science in Architecture

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and Civil Engineering**

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Designing for Dementia: an Assessment of the Physical Environment on Wayfinding Success for Residents in Long Term Care Settings

Abstract

It is acknowledged that one of the consequences of the ageing process is cognitive decline, which leads to an increase in the incidence of illnesses such as dementia. This has become ever more relevant due to the projected increase in the ageing demographic. Dementia affects visuo-spatial perception, causing difficulty with wayfinding, even during the early stages of the disease. The literature widely recognises the physical environment's role in alleviating symptoms of dementia and improving quality of life for residents. It also identifies the lack of available housing options for older people with dementia and consequently the current stock is ill-equipped to provide adequate support.

Recent statistics indicate that 80% of those residing in nursing or residential care homes have some form of dementia or severe memory problems. The shift towards institutional care settings, the need for specialist support and care, places a greater impetus on the need for a person-centred approach to tackle issues related to wayfinding and dementia.

This thesis therefore aims to improve design for dementia in nursing and residential care settings in the context of Northern Ireland. This will be undertaken in order to provide a better understanding of how people with dementia experience the physical environment and to highlight features of the design that assist with wayfinding. Currently there are limited guidelines on design for dementia, meaning that many of these are theoretical, anecdotal and not definitive. Hence a greater verification to address the less recognised design issues is required. This is intended to ultimately improve quality of life, wellbeing, independence and uphold the dignity of people with dementia living in nursing or residential care homes.

The research design uses a mixed methods approach. A thorough preparation and consideration of ethical issues informed the methodology. The various facets were also trialled and piloted to identify any ethical, technological, methodological, data collection and analysis issues. The protocol was then amended to improve or resolve any of the aforementioned issues. Initially a questionnaire based on leading design recommendations was conducted with home managers. Semi-structured interviews were developed from this and conducted with staff and resident's next of kin. An evidence-based approach was used to design a study which used ethnographic methods, including a wayfinding task. This followed a repeated measures design which would be used to actively engage residents with dementia in the research. Complementary to the wayfinding task, conversational and semi-structured interviews were used to promote dialogue and direct responses with the person with dementia. In addition to this, Space Syntax methodologies were used to examine the physical properties of the architectural layout. This was then cross-examined with interview responses and data from the wayfinding tasks.

A number of plan typologies were identified and were determined as synonymous with decision point types which needed to be made during the walks. The empirical work enabled the synthesis of environmental features which support wayfinding.

Results indicate that particular environmental features are associated with improved performance on the wayfinding tasks. By enhancing design for dementia, through identifying the attributes, challenges with wayfinding may be overcome and the benefits of the physical environment can be seen to promote wellbeing.

The implications of this work mean that the environmental features which have been highlighted from the project can be used to inform guidelines, thus adding to existing knowledge. Future work would involve the dissemination of this information and the potential for it to be made into design standards or regulations which champion design for dementia. These would increase awareness for designers and stakeholders undertaking new projects, extensions or refurbishments.

A person-centred, evidence-based design was emphasised throughout the project which guaranteed an in-depth study. There were limitations due to the available resources, time and funding. Future research would involve testing the identified environmental features within a specific environment to enable measured observation of improvements.

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Table of contents

Chapter 1: Introduction.....	1
1.1 Research problem and motivation	1
Solution	3
1.2 Aims and objectives	4
1.3 Research expectations, outcomes and limitations.....	4
1.3.1 Scope of the research	5
1.3.2 Originality and significance of the research	6
1.4 Methodology.....	7
1.5 Project findings.....	7
1.6 Structure of research.....	8
Chapter 2: Conceptual Framework	11
2.1 Introduction.....	11
2.2 Background of dementia	11
2.2.1 The ageing process and the design challenge	11
2.2.2 Setting the context.....	14
Nursing and residential homes in Northern Ireland.....	18
2.2.3 A brief history and evolution of the term dementia.....	18
2.2.4 Types of dementia.....	21
2.2.5 The effects and implications of dementia.....	22
2.3 Background of dementia in relation to design.....	23
2.3.1 The importance of the physical environment	23
2.3.2 The social environment as a necessary supportive element to design	24
2.3.3 Remain in the community or move?.....	26
2.4 Current concepts on design for dementia	28
2.4.1 Evidence-based design: existing design recommendations for dementia	28
2.4.2 Monitoring.....	31
2.4.3 Architectural design and wayfinding.....	32
2.4.4 Enhancing wellbeing	33
2.5 Perception of space and wayfinding	35
2.5.1 Experiencing through perceiving.....	36
Space and the effect on human behaviour	37
Development of perception	37
2.5.2 Affordances in design: the significance for cognitive impairment	38
2.5.3 A sensory experience.....	40
The senses and perception: ocular centricity and the need to appeal to other senses	
.....	40
2.5.4 Cognition of the physical environment	41
Spatial orientation and wayfinding: instinctive or intellectual?	41

Getting lost: capacity and cognition of the physical environment	42
2.5.5 Finding a way	44
Spatial cognition: finding places	44
The act of wayfinding	45
2.6 Gaps in the literature and research	47
2.6.1 Methodological considerations	47
2.6.2 Sample sizes	48
2.6.3 Adding to the existing knowledge base	48
2.6.4 The issue of wayfinding	49
2.6.5 Compliance with existing design in Northern Ireland	49
2.6.6 Critical review of existing work	50
Proposed course of action in response to the gaps	53
2.7 Summary	54
Chapter 3: Methodology	56
3.1 Introduction	56
3.2 Method of conducting the literature review	57
3.3 Preparatory work and pilot studies	59
3.3.1 Trials	59
Amendments resulting from the trials	60
3.3.2 Piloting phase	62
3.3.3 Piloting interview questions	63
3.4 Research ethics	63
3.4.1 Ethical approval	65
QUB School Ethical Approval	65
Police Disclosure and RQIA	66
Obtaining Ethical Approval from ORECNI	66
3.5 Sampling and recruitment procedures	68
3.5.1 Selection of fieldwork sites: nursing and residential homes	68
The role of the joint QUB and DSDC survey and the compiled list of homes	69
Considerations for the PhD Study	70
Plan typologies and types of routes	70
Visits to selected homes	71
Selected homes for the wayfinding tasks	71
3.5.2 Recruitment and informed consent for those participating in the wayfinding tasks. 72	
Recruitment through staff appointment	72
Principle inclusion criteria	73
Recruited participants	75
3.5.2 Recruitment of next of kin for interview	76

Linked to those who participated in the wayfinding walks	76
3.6 Selected methods	78
3.6.1 Semi-structured interviews	79
Development, piloting and review of interview questions	80
Specific details of staff/carer interviews	80
Specific details of interviews with the residents' next of kin.....	81
Wayfinding walks: briefing and debriefing.....	82
3.6.2 Wayfinding walks.....	83
Design and description of wayfinding walks	83
The role of Space Syntax.....	83
Planning the route	84
Action capability test	85
Repeated measures design	85
Measures of the walks	86
3.7 Triangulation of methods.....	87
3.8 Summary	89
Chapter 4: Interviews with Staff and Next of Kin.....	91
4.1 Introduction.....	91
4.2 Methods.....	91
Analysing the interviews.....	91
4.3 Discussion: thematic analysis of staff interviews	93
4.3.1 Activities	93
The importance of activities: the role of staff and relevance to residents	93
Features of the physical environment to support activities	94
Access to safe and secure outdoor space	95
4.3.2 Management and care issues	96
Caveat on environmental determinism: care issues must be considered alongside aspects of design	96
Changing needs: specialist care for dementia, new challenges and life stories for a better assessment.....	97
Monitoring and layout: staff continuity and risk versus quality of life	98
The role of assistive technology.....	100
4.3.3 Design issues	101
Outdated, missed opportunities and non-specific design	101
Design flaws and adaptations	102
Safe, secure level access and flooring	104
Positive attributes of design	105
Decoration and visual cues	107
Stages of care	108
Site selection, planning and community integration.....	109

Expectations for the future	110
4.3.4 Wayfinding.....	110
A common problem	110
Signage	111
Layout.....	114
Colour.....	114
4.4 Results from interviews with the next of kin	117
4.4.1 Activities	117
Continuity of social life, skills and independence.....	117
Promoting wellbeing	118
The role of the physical environment	118
4.4.2 Management and care issues	120
Reasons for moving in	120
Monitoring.....	121
Focus on dementia.....	121
The importance of care	122
4.4.3 Design issues	123
Benefits of the physical environment	123
Room for improvement.....	123
Location, location, location.....	124
The importance of good design.....	124
4.4.4 Wayfinding.....	126
Ability or inability?	126
Routine	127
Layout Issues	128
Design and Environmental Cues	129
4.5 Summary of findings	133
4.6 Summary	135
Chapter 5: Wayfinding Walks.....	137
5.1 Introduction.....	137
5.1.1 Action capability test: 10m walk test	137
5.1.2 Repeated measures design: three walks.....	138
The significance of the return journey	138
5.2 Comparison of the three walks.....	140
5.2.1 Patterns and differences across the three walks	140
Results from fieldwork site two (F2):	140
Results from fieldwork site three (F3):	142
Results from fieldwork site four (F4):	143
Results from fieldwork site five (F5):	143

5.2.2	Summary of findings from the three walks	146
5.3	Analysis and synthesis of the wayfinding walks.....	147
	Some common points for consideration:.....	148
5.3.1	Fieldwork site two (F2)	150
	Central area: the problem with symmetry and mirroring	150
	Corridors.....	152
	Feedback and debriefing.....	154
5.3.2	Fieldwork site three (F3)	159
	Central area: a recurring issue.....	159
	The nature of a T-junction: symmetry and missing wayfinding cues	160
	Straight corridor with locked doors.....	161
	Straight corridors	162
	Room numbers: wayfinding knowledge	162
	Feedback and debriefing.....	162
5.3.3	Fieldwork site four (F4)	166
	The problem with T-junctions	166
	Debriefing and other considerations	168
	Restrictions with fieldwork site four (F4)	169
5.3.4	Fieldwork site five (F5)	173
	Central area: featuring as a wayfinding issue again	173
	Corners of the circuit	175
	T-junctions	176
	The T-junction: created by the double circuit (figure of eight plan).....	177
	Straight corridors	178
	Feedback and debriefing.....	178
5.4	Wayfinding walks: a summary of findings and conclusions	191
	Common issues.....	191
	Layout considerations	191
	Possible wayfinding cues	192
Chapter 6: Discussion and Recommendations.....		195
6.1	Introduction.....	195
6.2	Discussion of findings from interviews	195
6.2.1	Architectural domain	196
	Layout: create a hub for monitoring, activities and provide access to outside	196
	Simplicity is key for wayfinding.....	196
	Clearly defined spaces, not multi-purpose.....	196
	Avoid lifts, stairs, locked doors, dead-ends and long narrow corridors.....	196
	Site selection and planning issues.....	197
	A lack of expertise in design	197

6.2.2	Interior architecture domain	198
	Light, internal and external views and function of rooms are obvious	198
	Improvements: redecoration, refurbishment and space for personalisation	198
	Features of interior design that support wayfinding	198
6.2.3	Personalisation domain	199
	Freedom of movement, sensory stimulation and affordances	199
	Activities: they might not remember them, but it has put them in a good mood	199
	Wayfinding: inability and instinct	200
6.2.4	Management and care issues	200
	The need for monitoring and greater care	200
	The challenge with future proofing and flexibility	200
	Avoid moving in the home: ageing-in-place	201
6.3	Discussion of results from Space Syntax with reference to the wayfinding walks	201
6.4	Discussion of results from wayfinding walks in relation to interviewee responses	202
6.4.1	Architectural domain	203
	Avoid long, straight corridors, with repetitive features	203
	The problem with central area junctions to corridors (symmetry)	204
	Entrances/exits are hidden.....	205
	Avoid dead-ends	205
	The problem with locked doors as control points.....	205
	Avoid kinks and geometry shifts in the plan.....	206
	T-junction issues (symmetry)	206
	Corners on circuits are problems	207
	Internal and external views assist with orientation.....	207
	Gardens are essential but poorly designed or overlooked	208
6.4.2	Interior architecture domain	208
	Avoid obstructions: seating layout, narrow corridors, doors, corners and kinks in corridors.	208
	Signage: should be relevant and at the right level	208
	Decor: furniture and antiques.....	208
	Murals and art work.....	209
	Distinctive features: shop fronts and memory boxes	209
6.4.3	Personalisation domain.....	209
	Sensory information as a memory trigger	209
	Sensitivity to the sensory environment	210
6.4.4	Management and care domain	210
	Activities	210
	Social care issues	210
	Design issues	210
	Wayfinding.....	211

6.5	Summary of design recommendations	211
6.5.1	Design considerations for the architectural domain	211
6.5.2	Design considerations for the interior design domain	212
6.5.3	Design considerations for the personalisation domain	213
6.5.4	Design considerations for the management and care domain	213
6.6	Conclusion: design recommendations that promote wayfinding.....	214
6.7	Summary	215
Chapter 7: Conclusion.....		216
7.1	Introduction.....	216
7.2	Background	216
7.3	Aims and objectives	217
7.4	Methodology	218
	Limitations	219
7.4.1	Overview of ageing and cognitive impairment	220
7.4.2	Overview of the design of the physical environment for people with dementia and the effect on wayfinding	220
7.4.3	Overview of ethical approval, critique and peer review.....	221
7.4.4	Overview of research design: piloting and ethical considerations	221
7.4.5	Overview of interviews with staff and next of kin	222
7.4.6	Overview of wayfinding walks	225
7.4.7	Overview of design considerations and implications	228
	Architectural domain	228
	Interior architecture domain	229
	Personalisation domain.....	229
	Management and care domain	229
7.5	Contributions	230
7.5.1	Contributions to architectural theory	230
7.5.2	Contributions to architectural practice.....	232
7.5.3	Addressing the gaps	233
7.5.4	Concluding summary	235
7.6	Further research.....	235
7.6.1	Assess the effectiveness of the design considerations.....	235
7.6.2	Application to other user groups and building typologies	236
7.6.3	Further research on specific aspects of the design considerations	236
7.6.4	Design better green spaces	236
7.6.5	Closing remarks	237
References.....		238
Appendices		

List of Figures

Chapter 2

Figure 2-1:	Derek Jacobi as King Lear (Persson, 2010).....	14
Figure 2-2:	Rate of dementia diagnosis in the UK (Alzheimer's Society, 2013a).....	15
Figure 2-3:	Timeline of events or theories which influenced the term 'dementia' and the growing interest in design research from the 1980s.....	20
Figure 2-4:	Dementia-friendly designed kitchen (McNair et al, 2010)	25
Figure 2-5:	Signage and the relevance to the residents (Pollock, 2007).	28
Figure 2-6:	Secure outdoor space (Pollock, 2007).....	30
Figure 2-7:	The frustration of dead-ends and locked doors (Gilles, 2010).....	32
Figure 2-8:	Long, narrow corridors are often found in nursing and residential homes where bedrooms are usually placed (Viva-lite, 2013).....	34
Figure 2-9:	Unfinished work by Leonardo da Vinci entitled "The adoration of the Magi" (Britannica, 2013).....	36
Figure 2-10:	Coffeepot for masochists by Jacques Carleman (Norman, 1988).....	39
Figure 2-11:	Perceived affordances.....	40
Figure 2-12:	Piazza Navona, Rome.....	42
Figure 2-13:	The five elements which combine to produce an environmental image (Lynch, 1960).....	43
Figure 2-14:	The "Dementia star" simulates difficulties experienced with perception and orientation (Image acquired from housing association linked to fieldwork site three and completed by the author).....	43

Chapter 3

Figure 3-1:	Pixelated figure seen during F2_P2_W1.....	62
Figure 3-2:	Flowchart showing an overview of research methodology.....	64
Figure 3-3:	The early stage of analysis and the process of synthesising findings.....	88
Figure 3-4:	Complementary A3 formatted sheet developed to be read with behavioural mapping sheets.....	90

Chapter 4

Figure 4-1:	Interview analysis process.....	92
Figure 4-2:	Large central area of F5.....	95
Figure 4-3:	Outdoor space: important for wellbeing and activities (Marshall, 2010).....	95
Figure 4-4:	Secure garden in F5 is visible when walking around the home.....	96
Figure 4-5:	A shift in the geometry in the plan of F2 causes difficulties with monitoring and communication for staff.....	99
Figure 4-6:	F4 is located on a rural site with large grounds and has an enclosed courtyard garden, however the landscaping is not fully realised. In many cases free access is limited or poorly located.....	102
Figure 4-7:	Long corridors in F3 with rest stops.....	103
Figure 4-8:	Plain un-patterned linoleum flooring (left), carpet (centre) and wood effect linoleum (right).....	104
Figure 4-9:	Double banked corridor in F5 with tonal change in carpet to demarcate different zones.....	105

Figure 4-10:	Adaptations to F2 shown in the image on the right.....	106
Figure 4-11:	Murals and tactile displays appeal to the senses.....	109
Figure 4-12:	Effective signage should include text and pictures.....	112
Figure 4-13:	Wall mounted memory box in F5.....	113
Figure 4-14:	The carpet colour was changed as part of the adaptations in F5.....	115
Figure 4-15:	Cognitive map showing a summary of the themes and codes which emerged from the staff interviews.....	116
Figure 4-16:	The shop area of F5.....	117
Figure 4-17:	Space use for activities in F5.....	119
Figure 4-18:	Zoning of F5 to enable free movement and accessibility.....	120
Figure 4-19:	Long corridors in F3.....	125
Figure 4-20:	Circuit plan of F5.....	128
Figure 4-21:	View of shop corridor in F5 which has an active cafe and hairdressers.....	130
Figure 4-22:	Cognitive map showing a summary of the themes and codes which emerged from the staff interviews.....	132
Chapter 5		
Figure 5-1:	VGA spectral graph is the same for both the outbound and return directions of the walks.....	138
Figure 5-2:	Graph showing the return walks of F3_P4.....	139
Figure 5-3:	Graph indicating speed for the return walks for F2_P4.....	141
Figure 5-4:	Outbound journey of F5_P1 walks.....	144
Figure 5-5:	Movement spectrum indicating speed in m/s for F5_P1.....	147
Figure 5-6:	Plans indicating detour taken by F2_P4 during walks two and three which may be related to issues of symmetry.....	151
Figure 5-7:	Improvements to the decor in F2 to make the corridors less generic.....	152
Figure 5-8:	The dead-end effect as a result of a kink in the plan in F2.....	153
Figure 5-9:	Image showing recess where adjacent bathroom is in relation to the Parlour.....	154
Figure 5-10:	Decor, furnishings and antiques were mentioned by F2_P1 and F2_P4 who knew the Parlour by these features.....	155
Figure 5-11:	High level signage can be difficult to see and furniture and seating layouts can interfere with movement and hinder wayfinding ability.....	155
Figure 5-12:	Summary of themes found presented as a cause and effect diagram from walks conducted at fieldwork site two.....	157
Figure 5-13:	Summary of wayfinding issues for fieldwork site two.....	158
Figure 5-14:	The central area of F3 posed many issues.....	159
Figure 5-15:	The prominent location of the entrance in F3 opens directly onto the central area.....	160
Figure 5-16:	Problematic T-junctions in F3.....	161
Figure 5-17:	Sections of corridor in F3 could be mistaken for dead-ends.....	161

Figure 5-18:	Summary of themes found presented as a cause and effect diagram from walks conducted at fieldwork site three.....	164
Figure 5-19:	Summary of wayfinding issues for fieldwork site three.....	165
Figure 5-20:	Straight corridor on the circuit of F4 make the corners appear as dead-ends.....	165
Figure 5-21:	Problems with T-junctions in F4.....	167
Figure 5-22:	Repetitive corridors in F4 have homogenous doors which are difficult to differentiate from one another.	168
Figure 5-23:	Summary of themes found presented as a cause and effect diagram from walks conducted at fieldwork site four.	171
Figure 5-24:	Summary of wayfinding issues for fieldwork site four.....	172
Figure 5-25:	The junction between the central area and corridors leading to other areas.....	173
Figure 5-26:	The shop corridor on the left and double banked bedroom corridors on the right.....	174
Figure 5-27:	The central area in F5.....	174
Figure 5-28:	The corners of the circuit are chamfered which helps to encourage residents to continue walking.....	175
Figure 5-29:	The chamfered corners of the circuit also create a multi-choice junction.....	176
Figure 5-30:	The T-junctions in F5 (similar to the other homes) are problematic as they give the option of more than one direction causing a reduction in speed, pausing and confusion about which way to go.....	177
Figure 5-31:	Positive environmental features in F5 which were discussed by participants during debriefing.....	179
Figure 5-32:	Summary of themes found presented as a cause and effect diagram from walks conducted at fieldwork site five.....	181
Figure 5-33:	Summary of wayfinding issues for fieldwork site five.....	182

All figures created by author, unless otherwise stated.

List of Tables

Chapter 2

Table 2-1:	Summary of common physical impairments experienced with increasing age as outlined by Brawley (1997) and Burton and Mitchell (2006).....	12
Table 2-2:	Summary of common sensory impairments experienced with increasing age as outlined by Brawley (1997) and Burton and Mitchell (2006).....	13
Table 2-3:	Compiled list of the range of dementia specific nursing homes in the context of Northern Ireland (Hadjri et al, 2011).....	16
Table 2-4:	Compiled list of the range of dementia specific residential homes in the context of Northern Ireland (Hadjri et al, 2011)	17

Chapter 3

Table 3-1:	A list of equipment trialled during the pilot stage of the wayfinding walks and what each item was used to record.....	60
Table 3-2:	Developed behavioural mapping table was as a result of trials.....	61
Table 3-3:	Details of the selected fieldwork sites.....	72
Table 3-4:	Matrix showing design details, and Space Syntax analysis (VGA, and avatar-based analysis) of selected fieldwork sites.....	74
Table 3-5:	Number of fieldwork participants recruited for the observed wayfinding walks in the four fieldwork case study sites.....	75
Table 3-6:	Participant profile data, and demographics for participants from F2, F3, F4, and F5.....	77
Table 3-7:	Summary of numbers of fieldwork participants in the interviews and observed wayfinding walks.....	78
Table 3-8:	A finalised list of equipment used during the wayfinding walks and what each item was used to record.....	86

Chapter 4

Table 4-1:	A tabulated summary of the findings which materialised from interviews.....	133-134
------------	---	---------

Chapter 5

Table 5-1:	A tabulated summary of the findings which materialised from interviews.....	138
Table 5-2:	Quantitative data from the walks conducted in F2.....	145
Table 5-3:	Quantitative data from the walks conducted in F3.....	145
Table 5-4:	Quantitative data from the walks conducted in F4.....	145
Table 5-5:	Quantitative data from the walks conducted in F5.....	145
Table 5-6:	A segment from the outbound journey from the F2_P4_W2 analysis matrix.....	148
Table 5-7:	Sample Microsoft Excel matrix for F2_P4_W1, showing collated data which can be referenced to synthesize findings.....	149
Table 5-8:	Common symmetry problems occurred during F2_P2_W3.....	150
Table 5-9:	Data sheet for F2 showing types of issues experienced during the walks and how often they occurred.....	156
Table 5-10:	Data sheet for F3 showing types of issues experienced during the walks and how often they occurred.....	163

Table 5-11:	Data sheet for F4 showing types of issues experienced during the walks and how often they occurred.....	170
Table 5-12:	Data sheet for F5 showing types of issues experienced during the walks and how often they occurred.....	180
Table 5-13:	Summary of findings from the wayfinding walks.....	183-190

Chapter 6

Table 6-1:	An excerpt from F4_P1_W2 matrix at point 4 showing the effect of a long corridor and the results from VGA and avatar analysis.....	203
Table 6-2:	An excerpt from the F2_P4_W3_O matrix at point 9 which illustrates the problems with a central area which has multiple decision points and symmetry of the plan.....	204
Table 6-3:	Excerpt from F3_P4_W3_R matrix at point 5.....	205
Table 6-4:	Excerpt from F2_P4_W3_R matrix at point 2 which illustrates the problems with a central area with multiple decision points.....	206
Table 6-5:	An excerpt from F3_P4_W2_O at point 4 where F3_P4 missed the right turn and is corrected in the right direction by the researcher.....	206
Table 6-6:	An excerpt from F5_P3_W1_R at point 9 where F5_P3 missed their turn into the living room and continued to walk around the corner.....	207
Table 6-7:	Summary of findings relating to the architectural domain.....	211-212
Table 6-8:	Summary of findings relating to the interior architecture domain.....	212
Table 6-9:	Summary of findings relating to the personalisation domain.....	213
Table 6-10:	Summary of findings relating to the management and care domain.....	213

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Chapter 1: Introduction

1.1 Research problem and motivation

It is now well established that ageing populations are rising on a global level, due to improved health care contributing to the increased number of people living longer. The World Health Organisation recognises the associated risk of incidences of dementia becoming more prevalent as a result of ageing (WHO, 2012). This is often viewed as a threat, putting economic pressure on society and service providers (Bowes, 2007; Spijker and Mac Innes, 2013). This research challenges these ideas and examines how innovation in architectural design can support people with dementia by enabling independence and purposeful lives.

The demographic transition and projected rise in the rate of dementia places an impetus on the need for specific design which responds by providing a more supportive physical environment. Zeisel (2001) explains that the physical environment can support people with dementia (if designed correctly) but can also be harmful. This is due to the fact that dementia alters brain function, altering how people with this disease perceive, understand and interact with their surrounding physical environment. The relevance of this research has grown over the past few decades, however, the Building Regulations and other legislation tend to focus more on access and mobility issues relating to physical impairment and do not consider cognitive or sensory impairments (Imrie, 2000). Consequently there has been no requirement to implement dementia specific design.

Dementia-friendly design can compensate for deficiencies experienced by those with the disease and is of particular importance as they tend to spend a large proportion of their time indoors (Passini et al, 2000; Joesph, 2006). A well designed physical environment can create a legible, user-friendly and enjoyable environment which can support wayfinding, independence, wellbeing and quality of life (Cohen and Weisman, 1991; Day et al, 2000; Bonner, 2005; Bonneyfoy, 2007). The literature proposes that the physical environment can be a therapeutic realm for people with dementia and this can be achieved through adequate lighting, reducing levels of noise, creating homely environments, improving the layout and providing landmarks to facilitate wayfinding (Evans, 2003; Calkins, 2009).

Although guidelines and regulations were mentioned earlier as a means of enforcing design principles, there is some concern regarding environmental determinism and the role of social environment, so there must be a synergy (Broady, 1966). In addition to this, guidelines may raise an awareness of design for dementia to architects but the design process should actively consider these ideas rather than merely using it as a tick-box exercise.

Cohen and Weisman (1991) produced an extensive set of design principles which were highly influential and still widely referenced. Other campaigners for championing design for dementia in the United Kingdom are the University of Stirling and Dementia Services Development Centre (DSDC), the Helen Hamlyn Centre for Design, Universities of Bradford, Warwick and Sheffield.

Although many dementia design principles are cost neutral, they are seldom implemented due to lack of awareness (de Waal et al, 2013). Fleming et al (2011) also recognise that the lack of empirical data and conclusive evidence may contribute to overlooking design for dementia. While interior design can easily be rectified during a refurbishment, architectural design, layout and structure is more difficult and costly to alter. When designing for dementia, it is therefore imperative that principles are instilled from the outset of the project, even during conceptual design and planning.

The past three decades have seen a rise in interest in research on design for dementia. This is timely and a response to the growing need. However further research is required to extend the evidence-base and improve understanding of this (Evans, 2003; Reimer et al, 2004; Calkins, 2009). Powell Lawton (2001) suggests that dementia design research has potential benefits to users other than those with dementia and may be transferrable to other complex building typologies. This research proposes a more holistic approach to caring for people with dementia by recognising that architecture and the design of the physical environment of long term care settings needs to be better addressed. Daykin et al (2008) explains that wayfinding is problematic even in the early stages of dementia and is ever more difficult in environments such as long term care settings. This will therefore form the focus of this PhD study.

It is evident from the literature that there are gaps regarding dementia design research. This concerns methods, especially those linked with involving people with cognitive disabilities and the lack of investigating the design of care facilities (Evans, 2003). Studies by Marquardt (2011) have identified that architectural floor plans have not been examined as part of the investigation surrounding wayfinding for people with dementia in care institutions. These must be considered in order to inform a more responsive outcome that will provide a greater understanding of how to improve the wayfinding experience of people with dementia.

Solution

A significant gap has been identified in the literature which outlines the context for the research problem. This provides the motivation and support for the need for further research on wayfinding for people with dementia and the role of the design of the physical environment in long term care settings. This aims to contribute to architectural research and practice by raising awareness of design for dementia and adding to the existing knowledge base which designers can use and reference. Primary benefits are intended for the experience of building users, including the residents with dementia, staff and visitors.

In order to address these aspects, it is proposed that a combination of appropriate methods will be employed, whereby people with dementia will be directly involved in the research. This aims to elicit their first hand responses and provide a greater understanding of their perspectives. The intended outcome is that this will inform design principles specific to dementia.

Existing design guidelines for dementia will be examined as part of the process. The methodology and research protocol will be developed sensitively to promote the participation of people with dementia in the research. This will be complemented by involving care home staff and next of kin who will provide additional information which will assist in developing a holistic overview of the topics under study.

The thesis will assess architectural design requirements in relation to dementia specific long term care facilities. The thesis will therefore develop design recommendations intended for architects to reference when designing long term care settings for people with dementia. The investigation places an emphasis on exploring the residents' wayfinding experience and how the design of the physical environment affects this and may be improved accordingly.

1.2 Aims and objectives

This thesis will critically assess current thought and the extent to which architectural design caters for people with dementia living in long term care settings. It will investigate and identify features of design which assist or hinder the wayfinding ability of those with dementia. The overall aim is to establish a greater knowledge and understanding of how the design of the physical environment affects those with dementia.

The objectives of the research are:

- To identify and explore the extent to which current thought and design tools assist architects in designing for people with dementia.
- To develop a research design that incorporates relevant methods to enable people with dementia to participate directly in the research.
- To establish design features of the physical environment that positively or negatively impact wayfinding success for residents with dementia.
- To propose considerations for the design of long term care facilities which architects can reference to help to improve the design of the physical environment, in particular to enhance spatial orientation and the wayfinding experience with a view to promoting the quality of life of the occupants.

1.3 Research expectations, outcomes and limitations

This thesis will examine the role of the design of the physical environment and how it may assist people who have dementia with wayfinding. It is hoped that emerging findings may complement existing design guidelines and inform new ideas regarding design for dementia.

One of the key aspects of the thesis was to involve people with dementia and establish them as valid contributors to the research. This posed one of the major challenges of the research project. Ethical approval was required firstly from the School's Research Ethics Committee (SREC) and following this from the NHS ethics body, The Office of Research Ethics Northern Ireland (ORECNI). This required a thorough preparation of the research methodology and protocol which would sensitively consider all related ethical issues. Various experts were consulted, including an Alzheimer's Society advocate and training was undertaken by the researcher in order to better understand how to overcome the ethical issues and involve people with dementia in the research.

Additionally, trial and pilot phases were undertaken to identify and mitigate any ethical, methodological, or technological issues before initiating any fieldwork.

This provided the author with experience and assisted in the development of the methodology. This proved to be time-consuming but enabled a smoother process during the fieldwork.

The methodology demonstrated efficiency, obtaining a variety of perspectives using mixed methods including architectural computing, ethnographic methods and in-depth semi-structured interviews. However, the resulting large quantity of data required much consideration to effectively deal with this. In response, a framework was developed to compare and contrast the data set and involved the creation of a matrix which would be used to synthesise findings.

The researcher's skills developed alongside the complexity of the research, which improved the competency of the project. Further limitations of the thesis included the timescale, restrictions on available resources, such as equipment and funding and the fact that all of the fieldwork was conducted solely by the researcher.

From inception of the project, the researcher anticipated potential benefits and contributions to be made to architectural theory and practice. The emerging knowledge could be used to supplement existing design recommendations for people with dementia. The use of methods from different disciplines was essential to convey how social processes sometimes differ from the architect's original intention. Although the research was conducted within the context of Northern Ireland, other exemplary international models were visited and examined. These principles are transferrable and have an application to other cultures. The main focus was on wayfinding for people with dementia living in specifically designed long term care settings. The research may therefore have a wider relevance to other complex building typologies, such as hospitals, airports, or to other users who are particularly sensitive to their surroundings and may require greater assistance with wayfinding, including people with sensory impairments.

1.3.1 Scope of the research

The focus of this thesis is the design of dementia specific to long term care settings in the context of Northern Ireland which has a larger number of homes for people with dementia than anywhere else in the UK (Bell, 2010). The defined building typology will be used to investigate how wayfinding could be improved for people with dementia and identify any issues relating to the design of the physical environment.

The first part of the review will concentrate on ageing and the physical environment and will be used to discuss the role of architectural design as a supportive realm for people with dementia. The latter part of the literature review establishes the problems experienced with wayfinding for those with dementia. Architecture and psychology will both be used to develop the research and to analyse the findings which aim to complement and inform current design recommendations for dementia.

1.3.2 Originality and significance of the research

The research is significant and timely, responding to the global phenomenon of ageing populations which sees a rise in age-related impairments and particularly relevant to this thesis, the rise in cognitive impairment and dementia. Over the past few decades there has been more of a focus on how the design of the physical environment can support people with dementia. This realisation acknowledges that there must be a more holistic approach to supporting and caring for those who have cognitive impairment. People with dementia are more susceptible to their surroundings and a poorly designed environment impacts by causing stress, anxiety, increasing challenging behaviours and having an overall negative effect on their wellbeing. Conversely a well designed environment can improve wellbeing, independence and even compensate for the cognitive frailties of the person with dementia (Zeisel, 2001).

Current leading dementia design guidelines in the UK have been developed by Stirling University with the DSDC and the Helen Hamlyn Centre for Design, based on the existing research evidence. This thesis examines and critiques the extent of the dementia design guidelines, establishing gaps in the knowledge and consequently identifies a direction for the research to follow. This involves an in-depth investigation of the architectural design of long term care settings and the effect on wayfinding for people with dementia. Through examining this human-environment interaction, guidance on design for dementia has emerged.

A novel approach was adopted to involve people with dementia in the research. The research design was developed to allow this to happen. Staff and next of kin were also participants and provided important supplementary information which was obtained through semi-structured interviews. The research conducted with dementia participants involved a wayfinding task and a unique approach using architectural computing assisted in its analysis. This was confirmed in the results which fulfilled the aim of the project by providing additional design guidelines for dementia and supplementing existing and established design guidelines.

1.4 Methodology

The research uses an inter-disciplinary approach to provide an understanding of the psychological processes involved in the spatial experience of people with dementia which enables them to make sense of the physical environment. Literature reviews examined the effects of an ageing population within the context of architecture, highlighting a rise in cognitive decline and dementias. A mixed methods approach was adopted to provide a triangulation which used ethnographic methods and behavioural mapping to enable the participation of residents with dementia. The development of the methodology was iterative and responded to the gaps identified within the review of literature and other considerations, including ethical issues and pragmatic issues which were identified during the trialling and piloting stages.

1.5 Project findings

This research showed that design for people with cognitive disabilities, such as dementia is commonly overlooked and the lack of legislation and shared knowledge may be responsible for this. A holistic approach is required to support people with dementia. The benefits of the physical environment are widely acknowledged, as it can alleviate symptoms of the disease, including stress, anxiety and enable independence by promoting activities of daily living and wayfinding ability. Wayfinding is a common early problem linked with dementia and complex environments such as long term care settings, which can make it more of a challenge. The course of investigation therefore examined how the design of the physical environment of these building typologies affected wayfinding ability of residents with dementia.

A research design was developed to involve people with dementia in the research. This resulted in a wayfinding task, from which rich data emerged. In addition to this, semi-structured interviews were conducted with staff and next of kin associated with the participants of the wayfinding walks.

As a result, design recommendations were organised under four domains, including architecture, interior design, personalisation and management of care. The layout was recognised as an influential factor in enabling wayfinding success.

It was found that simple, legible and accessible layouts were best, whereas symmetry and homogeneity had the potential to cause confusion and lead to getting lost. Landmarks, signage and distinctive features were viewed positively and helped with orientation.

The positioning of furniture and objects within space can influence movement and impact on choice of direction and thus impact on wayfinding. The unique experience to each individual was recognised and with this understanding, the importance of the sensory environment was noted to be important for an individual's perception and formation of memory of space which can assist in wayfinding. The design of the physical environment was acknowledged as impacting on the delivery of care, so this should be considered as part of the architectural idea. It was suggested that establishing routine for people with dementia was important in promoting independence. This could help to avoid confusion, thereby improving orientation and wayfinding.

The impact of this has the potential to benefit and contribute to architectural theory and practice. The use of a novel approach to the research revealed new findings on design for dementia which have a useful application for architects to consider during the design process. This research has a wider relevance and may extend to other complex building typologies or user groups.

1.6 Structure of research

This thesis is arranged in seven chapters. The first two chapters consider the epistemological, theoretical and contextual background to the research. Chapter 1 presents the background to the research problem and motivation. It then outlines the aims and objectives for the research and identified research expectations, scope and limitations. Architectural design often overlooks cognitive and sensory impairments, so it is important to explore how design could be more considerate for people with dementia. The introductory chapter also highlights the originality of the research and how a novel approach to the methodology, involving people with dementia in the research and using a mixed methods approach to create a triangulation. The outcome was dementia specific design recommendations which concentrate on wayfinding in long term care settings

Chapter 2 presents the theoretical framework, whereby theories and research relating to the area of inquiry are examined to identify gaps and define the research problem. This explored the effects of an ageing population and the rise in dementia which creates a challenge for design. The role of the physical environment is profoundly significant and there is a need to approach caring for people with dementia more holistically.

The benefits of good design can alleviate issues associated with dementia and provide a supportive realm. Wayfinding is problematic in larger, more complex buildings such as long term care settings, so this became the focus of the investigation.

The methodology is discussed in Chapter 3 and is informed by the research gap with reference to ethical issues and involving older people with dementia in the research. These were influential during the development of the research design. The successful participation of people with dementia in the research was important to elicit their first hand responses with respect to wayfinding. This presented ethical challenges which required thorough consideration of various issues, including sampling procedures, informed consent, data collection and analysis. After successfully completing ethical approval, fieldwork sites were selected to allow in-depth exploration of wayfinding. A mixed methods approach was opted for to enable triangulation throughout the study.

Following the methodology based chapter, Chapter 4 and Chapter 5 form the experimental chapters. Chapter 4 provides details of the processes used to conduct the semi-structured interviews. These were conducted with the staff of the nursing or residential home who were considered important as they have a day-to-day knowledge of how the residents interact with the physical environment. Next of kin of the residents who participated in the wayfinding walks were also interviewed who have a long-term knowledge of the person before they moved into the home.

A form of semi-structured interview was used during the wayfinding walks with the people with dementia. The approach was a more conversational style used in briefing and debriefing sessions in connection to the wayfinding task. This is presented in Chapter 5 alongside the results of the wayfinding tasks and this feedback was interpreted in conjunction with the observed wayfinding issues to identify the potential environmental causes.

Chapter 5 also examines the performance of the participants across three walks which follow a repeated measures design. This was conducted to establish whether people with dementia had the ability to learn routes and improve the success of wayfinding.

Carrying on from this, Chapter 6 provides a discussion of the recommendations and proposes considerations for architects designing for dementia as a result of the research findings. The design recommendations which emerged from the interviews and wayfinding tasks were organised into four domains, including architectural, interior design, personalisation and management and care.

The thesis closes with conclusions in Chapter 7, which provide an overview of the work conducted, from the literature review which help to identify the research problem to the development of the research design and methodology. This highlights how the findings from the fieldwork interviews and wayfinding tasks were used in conjunction with Space Syntax to synthesis design considerations. This chapter also considers how the research has contributed to architectural theory and practice and proposes direction for future research.

Chapter 2: Conceptual Framework

2.1 Introduction

This chapter initially explores the impact of an ageing demographic and the challenges it presents in terms of design. It then examines the increase in dementia, the impact it has on the individual and how the design of the physical environment can be used as a facilitator for wayfinding which is recognised as a common persistent problem for those with dementia. It also examines how the design of the physical environment impacts on people with dementia and in particular how it affects their wayfinding ability. The aim of this chapter is to provide a summary of theories relating to issues of design for dementia, the research relating to this area and identifies gaps in the literature by defining the research problem.

2.2 Background in dementia

The effects of ageing can lead to the depletion of physical, sensory and cognitive ability. Cognitive impairment becomes the focus since it is often overlooked (Mitchell et al, 2003). Architectural design often fails to address issues relating to sensory or cognitive problems, making the spatial experience of wayfinding difficult or even impossible. The design of the physical environment has a responsibility in being supportive rather than an inhibitor and should promote the dignity and independence of all (Kitwood, 1997). This section provides the context for this thesis, establishing common problems experienced for those with dementia, outlining a history and definition of the term “dementia” which will be referred to throughout this thesis.

2.2.1 The ageing process and the design challenge

It is evident that there is an ageing population with the increase in longevity connected to the success of modern medicine and improved living conditions. This does, however, pose new challenges including dementia. The World Health Organisation (WHO, 2007) indicated that global population statistics predict rapid ageing and the number of people aged over 60 will reach 1.2 billion by 2025. They suggest that the impact of an ageing population will be more significant than population growth (WHO, 2008). Tinker (1997) highlighted these new challenges for healthcare providers, employers and designers over a decade before and claimed that “...the profile of older people is changing...we have an ageing population but certain groups are coming more into prominence. These include those who are very old, those with dementia...”

Conceptual Framework

The latest statistics in the UK (ONS, 2012) suggest that by 2037 the number of people aged over sixty will rise from 19.4 million in 2012 to 31.1 million and the number of people aged over eighty is to double to almost six million. Kitwood (1997) argues that ageing does not necessarily result in reduced functionality or diminished capacity and affects individuals in different ways. Burton and Mitchell (2006, pp.24-27) also recognise this and highlight that the ageing process can make some people more susceptible to physical or cognitive challenges. Changes in the ability to process, react, recall and learn new information is likely to be experienced by older people. Burton and Mitchell (2006) refer to this as general mental decline and suggest it can be aggravated by conditions such as urinary tract infections which can in turn cause short-term memory issues. People who experience this or slower reaction times due to sensory problems, may fear they are developing dementia or may be misunderstood and thought to be developing dementia (Burton and Mitchell, 2006).

The problems associated with ageing are often overlooked in terms of design, particularly those relating to sensory and cognitive issues. With an ageing population it is imperative that these are considered in response to this need. A summary of physical and sensory issues highlighted by Brawley (1997) and Burton and Mitchell (2006) are shown in Table 2-1 and Table 2 respectively.

Physical challenges linked to ageing		
Issue	Effects	Causes/results in
Strength	<ul style="list-style-type: none">• People aged over 70 have around half the strength and stamina they did as they had in their 20s.	<ul style="list-style-type: none">• Carrying, lifting, pushing and pulling become difficult.• Walking speed is reduced.
Mobility	<ul style="list-style-type: none">• Stooped posture: unsteady gait.• Bone or joint problems	<ul style="list-style-type: none">• Look down at ground as they walk.• Become unaware of surroundings or hazards.• More prone to falls.

Table 2-1: *Summary of common physical impairments experienced with increasing age as outlined by Brawley (1997) and Burton and Mitchell (2006).*

Sensory problems linked to ageing		
Issue	Effects	Causes/results in
Hearing	<ul style="list-style-type: none"> • Unable to distinguish different sounds. • Loss of ability to hear higher frequency sounds. 	<ul style="list-style-type: none"> • Stimuli or environmental information is missed. • Communication problems. • Disorientation/confusion.
Vision	<ul style="list-style-type: none"> • 90% of blind people are aged over 60. • 98% of over 65s wear glasses (natural deterioration over the age of 40). • Age increases the risk of serious visual impairments (caused by medical conditions). • Visual acuity is reduced. • Colour agnosia (harder to distinguish colour). • Impaired depth perception. 	<ul style="list-style-type: none"> • Stimuli or environmental information is missed. Disorientation/confusion.
		Remedies <ul style="list-style-type: none"> • Need 3-5 times more light for over 60s. • Eliminate glare (disorientation/confusion). • Provide contrasting colours to distinguish elements (e.g. walls from floors). • Trips and falls (avoid patterns, dark floor surfaces or shiny floor surfaces).

Table 2-2: *Summary of common sensory impairments experienced with increasing age as outlined by Brawley (1997) and Burton and Mitchell (2006).*

Bowes (2007; 2007a) explains that policy documents are pre-occupied with the impact of the ageing population, which is surrounded by derogatory stereotypes which views older people as dependent, unproductive and a burden in terms of care and the associated costs. Negative stereotypes and the portrayal of older people are often used in the arts and media which can be influential on how society perceives them as frail or unable (see Figure 2-1). It is understandable how dignity is overlooked when there is a focus on such issues. However there must be a realisation that older people are valid contributors to society and there must be a commitment to care for them when this is needed.

Jacobson et al (2009) write about how physical and social environments can violate dignity, particularly for those who are vulnerable and the implication can have an ill-effect on the health and wellbeing of the individual. Dignity can be violated by the physical environment when it forces someone into dependence, or restricts and discriminates against them. The design of the physical environment must therefore be supportive of all the needs of older people, including neglected areas of design which deal with sensory and cognitive impairment.



Figure 2-1: Derek Jacobi as King Lear (Persson, 2010).

Ageing has always been topical in the arts and media, creating stereotypes which sometimes are discriminatory. King Lear is frequently portrayed as a powerful ruler with great dignity who declines throughout the play into frailty and foolishness.

2.2.2 Setting the context

The Alzheimer's Society provide statistics and predictions on the prevalence of dementia. They state that there are 800,000 people with dementia in the UK which incurred a financial cost for formal and informal care of over £23 billion in 2012. This thesis was based within the context of Northern Ireland and studies the effect of design of nursing and residential care homes on wayfinding success for residents with dementia. Northern Ireland has a high proportion of dementia specific long term care settings¹ per capita for those aged over 65 (Bell, 2010).

¹The Elderly Accommodation Counsel (2012) clarifies regional discrepancies on the jargon surrounding long term care homes. Northern Ireland refers to nursing homes (with medical care, and higher level of dependency), and residential homes, whereas the rest of the UK use care home with nursing, and care home respectively. All of these are a

Conceptual Framework

It is suggested that this may be representational of the higher levels of disability reported and a preference for the type of care provision. In total there are around 5,000 spaces in 75 nursing homes (Table 2-3) and 44 residential homes (Table 2-4) for a predicted number of 19,400 people with dementia (Alzheimer's Society, 2013). Diagnosis rates in Northern Ireland were regarded as one of the highest in the UK with a rate of 63% diagnosis in 2012 (Alzheimer's Society, 2013a; see Figure 2-2). However this figure has since stalled with only an increase of 0.2% in diagnosis reported in the State of the Nation (2013).

The implication of this is that there are 7,148 people expected to be living in Northern Ireland who have not been diagnosed with dementia (Alzheimer's Society, 2013b). It is predicted that two thirds of people with dementia live in the community while one third will reside in a care home. This figure is expected to be higher as it was reported that 80% of residents in care homes (including general care homes) have some form of dementia but may not have been diagnosed (Alzheimer's Society, 2013c). This corresponds with the findings from the 2013 State of the Nation report. A lack of support in the community and a greater need for care places a greater emphasis on the need for long term dementia care settings (Bell, 2010; Bowes, 2007).

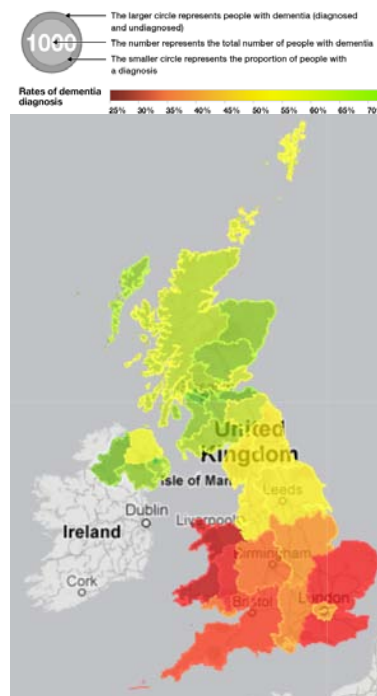


Figure 2-2: Rate of dementia diagnosis in the UK (Alzheimer's Society, 2013a).

Diagnosis rates of dementia are higher in Northern Ireland and Scotland than in England.

form of housing intended to provide a level of care to support residents with dementia for an extended period of time.

Conceptual Framework

	Home/Agency Title	Address Line 1	Town	Postcode	Maximum No	Manager/First Name	Manager/Surname	Provider Organisation
1	Antrim	88 Milltown Road	Antrim	BT41 2JJ	53	Una	McTaggart	Four Seasons Health Care
2	Massarene Manor	6 Sleepie Road	Antrim	BT41 1AF	50	Olivia	Hall	Massarene Manor
3	Ard Mhacha House Care Centre	Desart Lane South	Armagh	BT61 8AR	75	Toni	Nixon	Southern Cross Healthcare
4	Dunlary Care Centre	224 Keady Road	Armagh	BT60 9EW	58	Mary	McKee	Southern Cross Healthcare
5	Greenpark	15 Keady Road	Armagh	BT60 4DH	62	Nuala	Burke	Greenpark
6	Hamilton Court	45 Hamiltonsbawn Road	Armagh	BT60 1HW	35	Rosemary Wilson	Spiers	Four Seasons Health Care
7	The Retreat Care Centre	62 Drummilly Road	Armagh	BT61 8RH	41	Dawn Elizabeth	Rhodie	Southern Cross Healthcare
8	Copperfields	1-3 Moore Street	Aughnadocky	BT69 6AX	32	Charith	McKeown	Edwards Enterprises N.I. Ltd
9	Brasfield	2-6 Camcomb Road	Ballymena	BT42 3LA	50	Paula	Kennedy	The Care Circle
10	Camphill	62 Toome Road	Ballymena	BT42 2BU	76	Louisa	Rice	Four Seasons Health Care
11	Rose Martha Court	30 Westbourne Avenue	Ballymena	BT43 5LW	55	Nicola Susan	McCrudden	Kathryn Homes Ltd
12	Oakridge Clinic - EMI Unit	14 Maghansknock Road	Ballynahinch	BT24 8TJ	32	Rachael	Mc Caffray	Four Seasons Health Care
13	Seapark	80 Lurgan Road	Barbridge	BT32 4LY	61	Tracey	Palmer	Four Seasons Health Care
14	Bangor	McKeown Suite	Bangor	BT20 3NG	30	(Sister) Heather	Murray	Four Seasons Health Care
15	Bryansburn	96-100 Bryansburn Road	Bangor	BT20 3RG	35	Avril	Roddy	Bryansburn
16	Camelsa	20-30 Crawfordsburn Road	Bangor	BT19 1BE	73	Mauro J	Magillan Jr	Four Seasons Health Care
17	Clandeboye	95 Cardy Close	Bangor	BT19 1AT	52	Joanne	Roy	Four Seasons Health Care
18	Abingdon Manor Care Centre	Armagh Suite	Belfast	BT14 8FG	10	Angela	Dorman	Abingdon Manor Care Centre Ltd
19	Beachhill	12 Royal Lodge Road	Belfast	BT8 4UL	34	Joanne	Dougan	Four Seasons Health Care
20	Bloomfields	115-117 North Road	Belfast	BT5 5NF	30	Imelda	raga (acting manag	Bloomfields
21	Cedarhurst Lodge	Beach Suite	Belfast	BT8 4RH	35	Lavina Ann	Harris	Four Seasons Health Care
22	Clifton House	2a Hopewell Avenue	Belfast	BT13 1DR	100	Marlene	Featherstone	Belfast Charitable Society
23	Collinsvale Court	Glen Road	Belfast	BT11 8BU	50	Stephanie J	Shannon	Collinsvale Court
24	Greenville Manor	192 Newtownbreda Road	Belfast	BT18 6GB	70	Stella	Law	Four Seasons Health Care
25	Our Lady's Home	68 Ard-Na-Va Road	Belfast	BT12 6FF	19	Maureen	Munster	Diocese of Down and Connor
26	Somerston EMI	77 Somerton Road	Belfast	BT15 4DE	26	Francis Martin	Wright	Somerston Private Nursing Home
27	Tennant Street	Balmoral Suite	Belfast	BT13 3GD	32	Jacquelyn Grace	Cairns	Four Seasons Health Care
28	Tudorvale	294 Holywood Road	Belfast	BT4 1SG	45	Viola	Graham	Four Seasons Health Care
29	Victoria Park	5-7 Connsbrook Avenue	Belfast	BT14 1JT	30	Rosendo	Soriano	Four Seasons Health Care
30	Silverdale	25a Castlegore Road	Castlederg	BT81 7RU	41	Geraldine	Brown	SFB Care Limited
31	Greenvale House	82-84 Mill Hill	Castlederg	BT81 9NB	39	Barbara Frances	Foster	Barnvale Cottage
32	Valley Nursing Home	8 Tullybroom Road	Clogher	BT76 0LW	96	Alison	Sweeney	Valley Nursing Home (MPS) Ltd
33	Garvagh	15 Kilrea Road	Coleraine	BT51 5LP	67	Louise	Mc Inish	Four Seasons Health Care
34	Fairfields Care Centre	80a Fair Hill Road	Cookstown	BT80 8DE	73		Sharon Loane	Care Circle Ltd
35	Aughnacloy House	2 Tandragee Road	Craigavon	BT66 1TL	71	Judith	Dorby	MD Healthcare Ltd
36	Glenview	11 Blessey Road	Craigavon	BT63 5NE	40	Linda	Kennedy	Glenview
37	Lisnisky	16 Lisnisky Lane	Craigavon	BT63 5RB	63	Edith	Harrison	Four Seasons Health Care
38	Mahon Hall	16 Mahon Road	Craigavon	BT62 3EF	60	Maribeth	Ritchie	Four Seasons Health Care
39	Glencarron	6 Creamery Road	Crossmaglen	BT35 9AD	44	Conagh	Grant	Glencarron
40	Craigdon	30 Dunminning Road	Cullybackey	BT42 1PE	35	Shirley Ann	Marshall	Four Seasons Health Care
41	Edgewater Lodge	Orlock Suite	Donaghadee	BT21 0LE	39	Karen	Nicholson	Four Seasons Health Care
42	Locale Lodge	26 Strangford Road	Downpatrick	BT30 6SL	60	Elleanor	Kerr	Four Seasons Health Care
43	Strangford Court	Miller Suite	Downpatrick	BT30 6SL	22	Chaire	McNally	Four Seasons Health Care
44	Ashbrook Care Home	50 Moor Road	Dungannon	BT71 4QB	49	Anne	Kappler	Ashbrook Home Ltd
45	Chestnut Lodge	47 Carrickaneas Road	Dungannon	BT71 7NH	40	Lorraine	Thompson	Four Seasons Health Care
46	Collagalsands	Lilistey Road	Dungannon	BT71 6SR	26	argaret Stella Elzabi	Blavins	Collagalsands
47	Corkhill Care Centre	27 Coolmaghery Road	Dungannon	BT70 3HJ	50	Branda	Rushe	Corkhill Care Centre
48	Geannan Care Centre	31 Ballygawley Road	Dungannon	BT70 1NH	54	Hazel Margaret	Black	Southern Cross Healthcare
49	Glenview	9 Cabragh Road	Dungannon	BT70 3AH	45	anor Elizabeth Carol	Sands	Glenview
50	Sanville	17b Annagher Road	Dungannon	BT71 4NE	27	Harriet	McMoran	Sanville
51	Ashbrooke Care Centre	2a Ashbourne Manor	Enniskillen	BT74 4BB	64	Heather	Johnston	Southern Cross Healthcare
52	County	42 Tempo Road	Enniskillen	BT74 6HR	58	Helen Roberts	Park	Four Seasons Health Care
53	Larne Care Centre	46-48 Coastguard Road	Larne	BT40 1AU	83	Branda Lee	Connon	Larne Care Centre
54	Corfield Care Centre	51 Seacoast Road	Limavady	BT49 9DW	76	Christine Mabel	Thompson	The Corfield Farmcare Centre
55	Limavady	1-7 Edenmore Road	Limavady	BT49 0RF	60	Martina	Mullan	Four Seasons Health Care
56	Rush Hall	51 Broughtier Road	Limavady	BT49 9DY	66	Martina	Mullan	Four Seasons Health Care
57	Lisburn Intermediate Care	119b Hillsborough Road	Lisburn	BT28 1JX	64	Caron Margaret	Conroy	Four Seasons Health Care
58	Rosevale Lodge	Garden / Rose / Vale Suites	Lisburn	BT28 1RW	66	Suzanne	Owen	Four Seasons Health Care
59	Arduagh	2 Arduagh Road	Londonderry	BT47 5SW	44	John	Coyle	Four Seasons Health Care
60	Greenhaw Lodge Care Centre	42 Racecourse Road	Londonderry	BT48 8DA	43	Shauna	Irvine	Southern Cross Healthcare
61	Laganvale	Dementia Unit	Moirs	BT67 0RE	36	Shily	Paul	Four Seasons Health Care
62	Ardmaine Care Centre	8 Fullerton Road	Nawry	BT34 2AY	65	Irene	Bowman	Southern Cross Healthcare
63	Ashgrove	55 Belfast Road	Nawry	BT34 1QA	52	Bijini	John	Four Seasons Health Care
64	Ben Madigan Care Home	36 Mill Road	Newtownabbey	BT36 7BH	64	Eileen	McCraels	Priority Care Homes Number 2 Limited
65	Beverly Lodge	186a Bangor Road	Newtownards	BT23 7PH	43	Janet	Davison	Ashdon Care Ltd
66	Drumragh	90 Dublin Road	Omagh	BT78 1TT	60	Heather	Lytle	Four Seasons Health Care
67	Hillcrest	23b Old Mounfield Road	Omagh	BT79 7EL	56	Julie Ann Elizabeth	Taylor	Knockmoyle Lodge Limited
69	Knockmoyle Lodge	29 Knockmoyle Road	Omagh	BT79 7TB	35	Nicola	McGloone	Knockmoyle Lodge
70	Slieve Na Mon	Tycur Road	Omagh	BT79 7TY	60	Ciaran	Burke	East Eden Ltd
71	Springlawn	44 Old Dromore Road	Omagh	BT78 1RB	42	Sharon Margaret	Colhoun	Springlawn
72	Rosemount Care Centre	2 Moy Road	Portadown	BT62 1QL	71	Nancy	Oriaga	Southern Cross Healthcare
73	Sandringham	24 Sandringham Court	Portadown	BT63 5BW	62	Adrian	Montary	Four Seasons Health Care
74	Ard Cuan Nursing Home	2 Cloughy Road	Portlough	BT22 1ND	10	James	Caldwell	Ard Cuan Nursing Home
75	Drumnaul House	41 New Street	Randstown	BT41 9AF	43	Maria Margaret	Bothwell	Hutchinson Homes Ltd

Table 2-3: Compiled list of the range of dementia specific nursing homes in the context of Northern Ireland (Hadjri et al, 2011)

Conceptual Framework

	Home/Agency Title	Address line 1	Town	Postcode	Maximum No	ManagerFirstName	ManagerSurname	Provider Organisation
1	Castle Lodge Care Centre	7-9 Fennel Road	Antrim	BT41 4PB	39	Una	Brady	Southern Cross Healthcare
2	Ferrard House	32 Station Road	Antrim	BT41 4AB	29	Alan John	McNinch	Northern HSC Trust
3	Ardview House	18 The Ward	Ardglass	BT30 7UP	39	Therese Carmel	O'Higgins	South Eastern HSC Trust
4	Fairlawns	63 Drumcairn Road	Armagh	BT61 8DQ	39	Claire Patricia	Murphy	Fairlawns
5	Sunnymead	12 Portadown Road	Armagh	BT61 9EE	39	Amanda Jane	Leitch	Sunnymead (Armagh) Ltd
6	Andena	206-208 Ballymoney Road	Ballymena	BT43 5HG	36	Christina Ann	Shields	Andena
7	Oakridge Residential Unit	14 Magheraknock Road	Ballynahinch	BT24 8TJ	10	Rachel	Mc Caffrey	Four Seasons Health Care
8	Cranley Lodge	5 Cranley Avenue	Bangor	BT19 7BY	58	Lisa Dawn	Strain	Cranley Lodge
9	Millbrook Court	228 Donaghadee Road	Bangor	BT20 4RZ	50	Siobhan Diane	Strong	Fold Housing Association
10	Ballyowen House	179 Andersonstown Road	Belfast	BT11 9EA	31	Colin	Morgan	Belfast HSC Trust
11	Brae Valley	2 Breda Terrace	Belfast	BT8 7BY	30	Helen Margaret	Boal	Belfast HSC Trust
12	Breffni Lodge	3 Wandsworth Road	Belfast	BT4 3LS	22	Maureen	Clarke	Breffni Lodge
13	Bruce House	6a Duncairn Avenue	Belfast	BT14 6BP	30	Edith	Fleming	Belfast HSC Trust
14	Cedarhurst Lodge	Cedar Suite	Belfast	BT8 4RH	34	Lavina Ann	Harris	Four Seasons Health Care
15	Kirk House	110 Kings Road	Belfast	BT5 7BX	45	Sarah	Penney	Belfast Central Mission
16	Orchardville House	12 Orchardville Avenue	Belfast	BT10 0JH	32	Gary	Kinthead	Belfast HSC Trust
17	Palmerston	9-17 Palmerston Road	Belfast	BT4 1QA	38	Eleanor	Hastings	Wesley Housing Association
18	Northwick House	1 Aghalun Road	Brookeborough	BT94 4HU	15	Carol Helena	Johnston	Northwick House
19	Karingmore	19 Largy Road	Camrrough	BT44 0EY	16	Mary Theresa	Hamill	Karingmore
20	Killynure House	26 Church Road	Carryduff	BT8 8DT	40	Pauline	McCullough	Belfast HSC Trust
21	The Brook	Brook Street	Coleraine	BT52 1QG	6	Karen	McCaughern	Northern HSC Trust
22	Mount Alexander House	Castle Lodge Park	Comber	BT23 5DW	36	Angeline	Taylor	South Eastern HSC Trust
23	Belvedere	63 Gifford Road	Craigavon	BT66 7EA	21	Cheryl	King	Belvedere
24	Guardian Residential Home	28 Moor Road	Dungannon	BT71 4QB	5	Jacqueline	Ryan	Guardian Day and Residential Care
25	Roxborough House	2 Dungannon Road	Dungannon	BT71 7SN	30	Lucia	Donnelly	Southern HSC Trust
26	Millverne	66 Mill Street	Enniskillen	BT74 6DW	35	Carol	Kelly	Carewell Homes Ltd
27	Newcroft Lodge	126 Church Road	Holywood	BT18 9BY	32	Samuel David	McMahon	South Eastern HSC Trust
28	Sir Samuel Kelly	39 Bangor Road	Holywood	BT18 0NE	40	Linda	Hook	The Salvation Army
29	Killyleagh Lodge	8 Downpatrick Road	Killyleagh	BT30 9RG	54	Kathleen Patricia	Lee	Killyleagh Lodge
30	Drumlough House	3-19 Moira Road	Lisburn	BT28 1RB	39	Michele	Barton	South Eastern HSC Trust
31	Laurelhill House	1a Ballymacash Park	Lisburn	BT28 3EX	30	Eugene	Lynch	South Eastern HSC Trust
33	Seven Oaks Housing with Care	Crescent Link	Londonderry	BT47 6DN	16	Janice	Pomeroy	Fold Housing Association
34	Seymour Gardens	Nelson Drive	Londonderry	BT47 6ND	26	Stephen	O'Connor	Western HSC Trust
35	Kashana	4 Knocknamoe Park Road	Omagh	BT79 7LD	3	Bridie	Hamdam	Kashana
36	Meadowbank Care Home	2 Donaghane Road	Omagh	BT79 0NR	25	Bernadette	Conway-McDaniel	Age Concern Help the Aged NI
37	Ard Cuan	1 Demesne View	Portaferry	BT22 1QX	18	Frances Ann	Mullan	Ard Cuan
38	Barrhall	15a Barrhall Road	Portaferry	BT22 1RQ	15	Kerry	Muskett	Barrhall
39	Ard Na Grainde	15 Moneyrod Road	Randalstown	BT41 3JB	3	Justin	McCann	Ard Na Grainde
40	Strawberry Fields	129b Staffordstown Road	Randalstown	BT41 3LH	6	Roisin	McCann	Strawberry Fields
41	The Cara	114 Duneaney Road	Rasharkin	BT44 8SR	18	Mary B	McDonnell	The Cara
42	Peacehaven	34-38 Newry Street	Rathfriland	BT34 5PY	8	Mary Helen	O'Hanlon	Peacehaven
43	The Sperrins Care Centre	1 Orchard Road	Strabane	BT82 9QR	12	Annie	Frobisher	Southern Cross Healthcare
44	Slieveleague	Edenmore	Tempo	BT743LU	8	Patricia	Grimes	Slieveleague
45	Moylinney EMI Unit	37 Ballyalton Park	Whiteabbey	BT37 0ET	39	James	Harvey	Northern HSC Trust

Table 2-4: Compiled list of the range of dementia specific residential homes in the context of Northern Ireland (Hadjiri et al, 2011)

Nursing and residential homes in Northern Ireland

There are a total of 119 dementia specific nursing and residential homes in Northern Ireland. This was identified by Hadjri et al (2011) who obtained this information under the Freedom of Information Act (2000). Within this number, 15 of the 45 residential homes are NHS run. The size and maximum occupancy of these homes range from as small as three up to 100 residents. Some homes are single storey and others are arranged over two or three floors. The plan shape type is influential in determining possible route types within the building and has relevance to the wayfinding experience. Therefore, a range of existing plan types were identified for the nursing and residential homes. This included linear, L/Y/H/T-shape plans and circuit type plans. The recognition of these main plan types was important in determining a sample of homes which was representative of the current approach to design in the context of Northern Ireland. Details about how the typologies and plan types were selected is in Section 3.5.1 (pp.67-68).

2.2.3 A brief history and evolution of the term dementia

Historically the term “dementia” has had less desirable connotations and is derived from the Latin word *demens* literally meaning “without mind” (Berrios, 2005). The ancient Greeks recognised that dementia was not a normal part of ageing and looked on older people with dignity and respect, placing their wisdom in positions of power in their government (Hamdy et al, 1998).

One of the earliest textual references to dementia was by the Greek judge Solon (around 500 BC) who revised laws relating to inheritance and making wills as they could be impaired in old age (Berchtold and Cotman, 1998). Pythagoras, Hippocrates, Plato and Aristotle all believed that dementia was an age related mental dysfunction, unlike the Roman philosopher Cicero who insisted that it was not a natural consequence of ageing but a weakness which could be postponed with an active mental life (Berchtold and Cotman, 1998). Berrios (2005) refers to the Roman poet and philosopher Lucretius who was one of the earliest recorded to use the term dementia by describing it as “being out of one’s mind.”

The description of what was classified as dementia continued to be derogatory in the seventeenth century when Thomas Willis declared it to be a state of “stupidity and foolishness.” Crime was declared as excusable in the case where the accused has dementia in the 1808 Code Napoléon.

Conceptual Framework

The meaning of “dementia” at this time referred to potentially reversible conditions such as delirium and schizophrenia (Berrios, 2005). Cicerco argued that dementia was not necessarily inevitable in old age and was continually discussed until the contemporary definition was constructed during both the late nineteenth and early twentieth century. By 1900 the cognitive paradigm was established and explained that dementia was associated with symptoms including: intellectual impairment, hallucinations, delusions, mood and behavioural disorders (Berrios, 1987).

Dementia is an umbrella term and refers to the symptoms which are caused by the specific diseases. It is not part of the normal healthy ageing process but the risk of these diseases increase with age (Cohen and Weisman, 1991). Alzheimer’s disease was identified in 1906 and is the most common form of disease which causes dementia. Symptoms associated with dementia are detrimental and include memory loss, depletion of language and communication skills, personality and behavioural changes (fear, anger, stress, anxiety and confusion), issues with problem solving and executive function, visuo-spatial problems and orientation or spatial problems (Kertesz and Mobs, 1996; Passini et al, 2000; Sutcliffe, 2001; Chui et al, 2005; Hagehorn et al, 2008; Davis et al, 2009). The next section describes what causes dementia and presents the most common forms of the disease.

Conceptual Framework

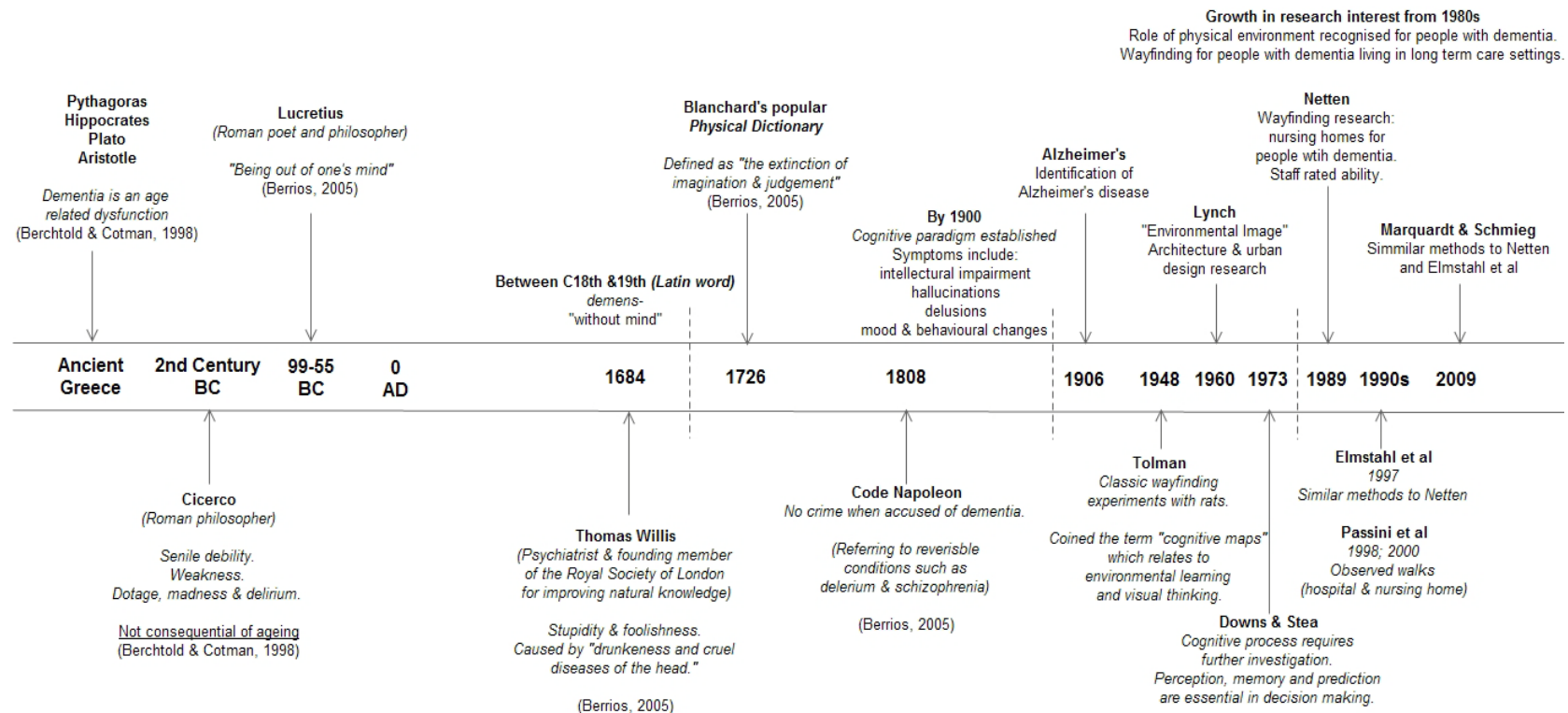


Figure 2-3: Timeline of events or theories which influenced the term 'dementia' and the growing interest in design research from the 1980s.

The summarised timeline shows key events or theories which were influential in the development of the contemporary definition of dementia and the emerging interest in design for dementia.

2.2.4 Types of dementia

Cohen and Weisman (1991) describe dementia as a progressive, irreversible neurological disorder which leads to the erosion of personal competency. The most prevalent forms of diseases that result in dementia are Alzheimer's disease (predicted to make up around 70% of dementias), vascular dementia, dementia with Lewy bodies, fronto-temporal dementia (Pick's disease) and less common are progressive supranuclear palsy, Korsakoff's syndrome (alcohol related dementia), Binswanger's disease, HIV/AIDS and Creutzfeldt - Jakob disease (CJD). Dementia may also develop in the progression of other diseases, such as motor neurone disease, multiple sclerosis (MS), Parkinson's and Huntington's disease (Alzheimer's Society, 2013). The prognosis of the disease is that most people die around seven to 10 years after diagnosis. However some people have survived with it for 15 to 20 years (Cohen and Weisman, 1991). The prevalence of dementia increases with age, DSDC (2013) report that for those over 60 the risk is about one in 20. This increases to one in four for those over 80 and to one in two for those over 90.

Sutcliffe (2001) explains that there are a variety of possible causes of dementia. The ageing demographic has been considered to be the main factor contributing to the increase in dementia in recent years. One such linked problem is the build up of the protein beta amyloid (this increases with age) which can cause plaques in the brain (Nikolaev et al, 2009). Genetic diseases such as Huntington's disease (chromosome 4 is defective) or Down's syndrome (extra copy chromosome 21) present an increased risk of dementia. Head injuries can cause an increase in the release of β -amyloid, similar to that seen in those with dementia in Down's syndrome and can lead to plaque build up. Alzheimer's, Pick's disease and many other dementias have no known cause and are thought to be linked with genetic disorders, environmental factors or lifestyle choices, including education, poverty, drug abuse, smoking, alcohol intake, diet and exercise (Zeisel, 1984). There is still some uncertainty regarding environmental factors including chemicals or poisons which may affect the brain. Aluminium was once thought to be a cause of Alzheimer's as traces had been found in the brains of those with the disease. However the same was found in the brains of those without dementia and water supplies with higher deposits of aluminium have not shown concentrations of Alzheimer's in the same areas, rather it is dispersed throughout countries.

Similarly Amalgam tooth fillings (containing mercury) and farm workers who are exposed to organic phosphates were thought to be risk factors, although Sutcliffe (2001) states that none of these have been determined as significant and highlights that dementia pre-dates these chemicals.

2.2.5 The effects and implications of dementia

Dementia is a wide spectrum, the type and stage of disease determines how each individual is affected. Generally, brain function is affected in three ways, through senile plaques, neuro-fibrillary tangles (both identified by Alois Alzheimer in 1906) and the loss of chemicals for efficient neurotransmission (Sutcliffe, 2001). The first signs of the disease are short term memory problems, lack of ability to orientate oneself in space and time, communication problems, with difficulty for new learning to take place (Cohen and Weisman, 1991). Common symptoms associated with dementia which should be considered in design are:

- Impaired communication (depletion of language skills).
- Memory problems and an inability to learn new things.
- Confusion, spatial and temporal disorientation.
- Visuo-spatial and perception problems (difficulty in recognising people, objects and patterns).
- “Sundowning” (increased confusion in the evening) and sleep disorders.
- Behavioural and mood changes (anxiety, stress, agitation and aggression).
- Sensitivity to sensory stimuli (including glare and noise).
- Stooped posture when walking (viewpoint is lower than normal-towards feet).
- Physical deterioration exacerbated with dementia (Cohen and Weisman, 1991; Burton and Mitchell, 2006).

This highlights how the effects of dementia may be influenced and exacerbated by the physical environment.

2.3 Background of dementia in relation to design

2.3.1 The importance of the physical environment

It is evident that as a person's mental and physical abilities decline, the importance of the physical environment increases. Passini et al (2000) emphasise the major role the physical environment has in compensating for deficiencies. A well designed environment may maintain residual mental and physical abilities, facilitate wayfinding, improve quality of life, provide a therapeutic realm and enhance wellbeing for those with dementia (Powell Lawton, 1996; Brawley, 1997; Day et al, 2000; Bonneyfoy, 2007). Joseph (2006) acknowledges the wide range of impacts the physical environment has on outcomes for users, associated with wellbeing which is increasingly important for those with dementia who tend to spend a large proportion of their time indoors. The physical environment is therefore recognised as a significant contributor in creating an overall conducive environment for residents with dementia who are particularly sensitive to their surroundings (Cohen and Weisman, 1991; Bonner, 2005).

With regards to crowding, Algase et al (2011) examined the effect of crowding in long term dementia care facilities. This indicated that increased density intensified people's reactions to situations, especially for those with dementia. Crowding also became a more prominent feature linked with physical characteristics (layout and room sizes) and in specific areas, for example in the dining room during meal times. This can cause psychological upset and even affect intake of food during mealtimes. This suggests that it may be best to provide smaller numbers with a greater spatial area to avoid the effects of crowding.

A range of individual (predisposing) and environmental (precipitating) factors which affect how the person with dementia responds to their environment were investigated by Voyer et al (2011). They reported that delirium was more prevalent and severe in older adults with dementia and that an inadequate physical environment was also a significant contributor, resulting in negative symptoms of the disease. It is widely recognised that architectural design is significant in creating positive experiences and can promote wellbeing. This is particularly important for those with dementia who are sensitive to how they perceive the physical environment.

2.3.2 The social environment as a necessary supportive element to design

The impact of the physical environment is now a widely recognised issue associated with the wellbeing and quality of life for those with dementia. Evans (2003) describes how the physical environment can directly or indirectly impact on the psychological wellbeing, by altering psychological processes. An increased interest in the relationship between dementia and the physical environment emerged in the mid 1990s, prior to this the physical environment was considered to have less of an impact on wellbeing (Calkins, 2009). Burton and Sheehan (2010) explain that the trend shifted from the thinking in the 1980s which associated negative behaviours as being linked solely to the environment to the more recent significance of how physical and social environments interact and how they can positively influence wellbeing and quality of life. Guite et al (2006) and Zeisel et al (2003) concur that there is a link between the physical environment and mental health and advocate that designers should consider noise control, lower density and access to green spaces for people with dementia. This is further supported by Cutler (2007) who observed the positive impact for those living in socially and physically supportive environments. This research noted an improvement in quality of life, independence and improved behaviours.

Physical and cognitive frailties may be supported by the physical environment through the application of positive factors including personal control, “normalness” or homeliness, cognitive support and personalisation, whilst health and safety features can be perceived negatively (Parker et al, 2004). Borbasi et al (2006) concur, stating that optimal design may compensate for disability by maximising independence and therefore improving quality of life. Alterations to the physical environment to improve privacy to enhance wellbeing were also reported by Bicket et al (2010). Reimer et al (2004) conducted a study which indicated that a special care facility was more successful in promoting wellbeing (through supporting independence, activities of daily living and enhancing quality of life) in residents with dementia than in what they referred to as traditional institutional style facilities. This was believed to be due to the purpose-built, more “home-like” environment. Incidences of aggression and depression were reduced in the special care facility. However less reassuringly, there was an increase in physical agitation which may have been linked to the reduced level of associated medications used compared with the traditional institutional facility (Reimer et al, 2004).

Conceptual Framework

Whall et al (1997) and Mohler et al (2011) emphasise that the use of physical restraint should be reduced or prevented wherever possible as this is not only distressing but a violation of the person's dignity.



Figure 2-4: Dementia-friendly designed kitchen (McNair et al, 2010).

This kitchen design successfully provides visual clues using transparent doors and familiar objects are placed on the counter, helping to define the function of the space. This space incorporates high levels of natural light from an overhead rooflight and promotes independence and activities of daily living.

This recognition that the design of the physical environment is highly influential and can create a therapeutic realm for people with dementia extends to those living in long term care settings (Voyer et al, 2011; Jarrott and Gigliotti, 2009; Hirano et al, 2011; Bicket et al, 2010). Reimer et al (2004) acknowledge that the physical environment must be supported by the social care environment and vice versa as they recognised that the competency of the carer (facilitator), in addition to the challenges and stimulation in the physical environment have a major impact on residents with dementia. This premise is again supported by Jarrot and Gigliotti (2011) who explain that a more competent facilitator is less vulnerable to shortcomings of the physical environment. Benefits were seen in the implementation of interventions in the social environment by delivering psycho-educational training from occupational therapists to carers of people with dementia (Gitlin et al, 2001). This enabled the application of interventions to allow for greater personal control, by simplifying objects or tasks in the home and provided a controlled level of stimulation to reduce incidences of agitation or aggression.

Although this required increased time from the carer, Gitlin et al (2001) observed that spouse upset was reduced and behaviour of the person with dementia was improved. In addition to this, inequalities stemming from environmental, socio-cultural and economic issues should be overcome as these can be major constraints in providing quality dementia care (Borbasi et al, 2006). It is therefore evident that the social environment is paramount alongside the physical environment. These must be considered in conjunction with one another to create a person-centred environment, as opposed to applying a universal approach (Kitwood, 1997; Simpson, 2010). This places a caveat on environmental determinism and recognises the need for a holistic approach as the design of the physical environment has its limitations, so cannot be the sole contributor to advancing dementia care.

The physical and social environment together can be conducive in alleviating symptoms associated with dementia, so it is therefore relevant to consider these factors holistically in order to attempt to create a synergy between them (Mohler et al, 2011). The implications of the socio-physical environment are now widely recognised as important in promoting wellbeing, independence and overcoming negative psychological responses associated with inadequate facilities, such as agitation, aggression and depression. People with dementia are sensitive to their surroundings so it is important to consider the physical and social environment and their potential to compensate for physical or cognitive frailties.

2.3.3 Remain in the community or move?

O'Malley and Croucher (2005) highlighted the lack of social policy relating to the physical environment of dementia facilities and argue that it appears to be a low priority on relevant political agendas despite wide recognition of these issues. They also suggest that the 1990 Community Care Act (UK), shifted the focus from nursing and residential homes to concentrating on enabling people to remain living at home, resulting in a number of these facilities closing their services for dementia. Reimer et al (2004) indicate that while it may be desirable to age-in-place and live at home, this may not always be practical or appropriate. There are a range of factors that can lead to institutionalisation, these include: a decline in cognitive abilities, an interest in improving independence and wellbeing for the person with dementia, alleviating the burden from the caregiver and providing a more supportive experience in an appropriate, sometimes purpose-built setting (Reimer et al, 2004).

Bowes et al (2011) highlight the social factors influencing the shift in care of older people which are: decreasing family size, greater geographical mobility, increased age at which people start families and different working patterns, especially for women. These all affect the level of direct family support for older people and can lead to an increased carer burden for relatives. Where the extended family may have cared for their older relatives years ago, influences like those described and added pressure elsewhere in modern lives may make this option unfeasible. Consequently, specialist support and care in the form of long term care homes may be required. Bowes et al (2013) also recognise that informal carers make a significant contribution in reducing the financial cost of care for people with dementia living at home. However the social cost, such as leaving the labour market to facilitate this form of care is often not taken into consideration. Assistive technology was therefore suggested by Bowes et al (2013) as having a role in facilitating the care of people with dementia in their own home. It is acknowledged that moving individuals with dementia can cause great stress and impact negatively on their behavioural symptoms. Smith et al (2010) however reported positive outcomes when dementia residents were relocated to a higher quality, purpose-built care units from what was described as an inadequate facility, not deemed to be supportive for people with dementia. This resulted in an improvement in independence, wayfinding, participation in activities, less stress and reduced challenging behaviour after relocating dementia residents

Institutional care for older people must therefore be better addressed given the trend for people with dementia to live in long term care settings (Fleming and Purandare, 2010; Bicket et al, 2010; Marquardt, 2011; Hirano et al., 2011; Sertel et al, 2011). Sertel et al (2011) argued that older people with reduced cognitive function benefit from the support available in nursing homes which enables greater physical activity and independence. Hirano et al (2011) concurs with this and posited that creating a more conducive environment can increase the incidence of physical activities for people with dementia. This in turn is linked with a reduced carer burden. This also indicates that countries are ill-equipped in terms of knowledge of design for long term dementia care facilities. Although it is more ideal to age-in-place, remaining to live in the community, there is still a trend and demand for people with dementia to move into specialist long term care facilities which provide greater support.

This places a greater impetus on the need for research to promote good design in long term care settings which cater specifically for dementia.

2.4 Current concepts on design for dementia

2.4.1 Evidence-based design: existing design recommendations for dementia

Evans (2003) states that “poor quality housing is linked to poor mental wellbeing.” This link between wellbeing and the physical environment is well established and the previous sections discussed its importance for people with dementia. Findings from work conducted by Evans (2003) revealed that social interaction could be improved by rearranging furniture. He also noted that better facilities have a positive effect on psychological adjustment. Other design features that were highlighted as beneficial for residents with dementia included smaller scale units (9-20 residents), controlled stimulation (including noise), provision of areas for wandering, increased daylight, adequate landmarks and signage, simple geometric floor plans and creating a home-like, familiar, non-institutional environment (Evans, 2003). Improvements to the physical environment were also seen when a renovation reduced the size of their units by dividing the larger space into multiple smaller units, which reduced noise, walking distances, increased quality of life and visits from family or friends (Gnaedinger et al, 2007).



Figure 2-5: Signage and the relevance to the residents (Pollock, 2007).

The image on the left shows generic ascending numbers on the bedrooms which can be meaningless to people affected by dementia. The image on the right shows some effort made to personalise the door with pictures, the person's name and the room number which relates to a previous address.

Wandering (or exploring) is a challenging, potentially dangerous dementia-related behaviour which should be considered in design of the physical environment (Bonner, 2005). Algase et al (2010) concluded that wandering was more likely in hallways (or corridors) and if the circulation space was minimised then the issue of wandering would be minimised. They also found that rooms with a designated function, such as the lounge or activity rooms, or spaces with a soothing or calming ambience, were less likely to cause wandering. The exception was in rooms such as the dining room, when it was not meal times. It was posited that this may suggest the resident has another need (eg. needing to go to the bathroom) which should to be addressed (Algase et al, 2010). Similar themes emerged in work conducted by Calkins (2005; 2009). Smaller households can improve mobility, quality of life, participation in activities of daily living, and improve social interaction while reducing negative psychological responses in the dementia residents (such as anxiety and depression). Non-institutional or “homely” environments are frequently referred to as desirable, although this term has not been universally defined. Non-institutional facilities tend to have more recognisable features and a diverse range of public spaces which provide for greater levels of socialisation. Reducing the size of the facility, careful choice of colour, avoiding patterns and concealing the nursing station were all described as preferred or non-institutional features which may improve wellbeing, independence, in addition to a reduction of agitation and verbal aggression (Calkins, 2009).

Cohen and Weisman (1991) and Brawley (1997) provided extensive practical design principles for a range of homes, including long term care facilities to address key issues for designing and modifying these to create more therapeutic settings. Their work covers sensory, reminiscence, homeliness, layout, entrances, shared space and activity spaces and has been influential and is still widely referenced. Sensory, such as food, art and music, were found to have a restorative effect, reducing agitation and aggression in an environmental psychology experiment conducted by Whall et al (1997). Mitchell et al (2003) summarises that all design guides address one or more of the following principles: familiarity, legibility, distinctiveness, accessibility, comfort and safety. Architectural design of the physical environment is paramount, while cues such as signage and distinctive features can support wayfinding, they cannot compensate for a poor plan layout (Marquardt, 2011).

Conceptual Framework

The configuration of the plan is important in promoting social activities and assisting wayfinding. It has not been determined whether signage significantly improves wayfinding, as people with dementia are inclined to have a lower field of vision in addition to eyesight problems, so the information may not be accessible or it may be confusing (Calkins, 2009).

Fleming and Purandare (2010) determined that there was strong evidence for using unobtrusive safety features. The size and shape of spaces should enable accessibility and functions to take place. Single bedrooms are better and it is important to maximise visual access to areas and control levels of sensory stimulation. Areas Fleming and Purandare (2010) felt that evidence was less strong related to signage, homeliness, small scale, provision of outdoor space and the opportunity to engage in ordinary activities. Outdoors space was noted by Calkins (2009) to alleviate symptoms associated with dementia such as stress and anxiety. With regards to bedrooms, the general consensus is that it is best if these are private rather than shared as it reduces stress and enables personalisation (Torrington, 2007). It is important to consider what the resident was used to before; sometimes it may be appropriate to share a room, or on the other hand if the person was previously using a larger bed, a single bed may be uncomfortable.



Figure 2-6: Secure outdoor space (Pollock, 2007).

Secure access to a garden space allows freedom of movement and can be used for meaningful activity.

2.4.2 Monitoring

One of the major difficulties with dementia care is monitoring of the residents as this can be demanding and monopolise staff time. Assistive technology is a viable option which has developed in recent years and allows for remote monitoring. Although the primary reasons for these technologies are presented as promoting independence and safety, it does raise legitimate ethical issues and may be received with suspicion by residents and cause distress (Schikhof et al, 2010). Bowes et al (2011) acknowledges that there are many benefits regarding the use of assistive technologies but warns that ethical considerations must also be balanced against these to ensure that the dignity of the person with cognitive impairment is not violated. The development of assistive technologies has been more focused on technical issues and is less concerned with ethical issues, particularly data protection, privacy, informed consent and surveillance (Bowes et al, 2011). These are protected within the European Convention of Human Rights (1950), [revised European Social Charter (1996) and the EU Charter of the Fundamental Rights of the European Union (2000)] under article 8 and the Universal Declaration on Human Rights and Fundamental Freedoms (1948) in article 12. Motivations for the development of these assistive technologies are not always clear and while there is a focus on promoting independence, safety, reducing health costs and carer burden, they highlight their concern that it can never be a substitute for care and human contact (Age Platform, 2008).

The design of the physical environment may help to assist with monitoring if the layout is compact and smaller scale which Schikof et al (2010) highlight is a more attractive psychosocial working environment. Staff retention and reducing carer burden is important to establish continuity in the lives of residents with dementia. Torrington (2007) suggested that staff retention can be improved through training. Sung et al (2004) identified reasons from staff as to why they continued to work long term in care settings to be (in order of importance): pay, relationships with residents, working environment, training opportunities and job satisfaction or gratification. The physical environment has the potential to alleviate symptoms of dementia and has a role as a non-pharmacological intervention, providing a therapeutic setting and supporting the delivery of care.



Figure 2-7: *The frustration of dead-ends and locked doors (Gilles, 2010).*

The design of nursing and residential care homes needs to be secure. However, dead-ends and locked doors have negative consequences, causing frustration and agitation with the resident who is denied access to areas.

2.4.3 Architectural design and wayfinding

In a review of literature conducted by Marquardt (2011) on wayfinding and the process of orientation in those with dementia, it was identified that there is a lack of studies, with only five focusing on the design of architectural floor plans, which included the key works of Netten (1989); Elmståhl et al (1997); Passini et al (1998; 2000). Design guidelines were outlined by Marquardt (2011) based on the previous research, these were as follows:

- There should be no further learning or requirement for higher skills to interpret the layout of these homes.
- Provide good visual access to other areas of the building as this is important to provide cues leading to social areas.
- Reduce the need for decision making and increase architectural legibility by making the function of spaces evident and providing cues to lead the way to areas.
- Long corridors and repetitive elements should also be avoided, as small scale units tend to be more successful.

It was necessary to explore the five pieces of work identified by Marquardt (2011) who derived the above recommendations on architectural design and wayfinding for people with dementia. In terms of environmental design, Passini et al (1998; 2000) found that signage could support resident's orientation.

This was in the form of using pictograms, resident's name or pictures and avoiding too much of a clutter of information. The following suggestions relate to building structure or architectural composition/layout:

- Small scale supported orientation (Netten, 1989; Marquardt and Schmieg, 2009).
- Long corridors should be avoided (Elmståhl et al, 1997; Netten, 1989). Elmståhl et al (1997) found that long, repetitive corridors caused greater disorientation than L-shaped or square-shaped units.
- Direct visual access supports wayfinding (Marquardt and Schmieg, 2009; Passini et al, 1998; 2000).
- Decision points should be simple and act as spatial reference points (Elmståhl et al, 1997; Netten, 1989; Marquardt and Schmieg, 2009; Passini et al, 1998; 2000).
- Avoid changes in direction (Marquardt and Schmieg, 2009). Marquardt and Schmieg (2009) found that residents found their way better in corridor type plans as opposed to those with changes in direction. This is contrary to what Elmståhl et al (1997) proposed regarding corridors causing greater disorientation.
- Places should display their function/meaning (Netten, 1989; Marquardt and Schmieg, 2009; Passini et al, 1998;2000). Marquardt and Schmieg (2009) explain that memorable reference points support allocentric orientation strategies. Places within the home should be architecturally legible.
- Avoid repetitive elements (Netten, 1989; Marquardt and Schmieg, 2009).

These recommendations are relevant to this thesis and will be considered throughout the research, particularly with reference to findings.

2.4.4 Enhancing wellbeing

By the end of the twentieth century, environmental psychologists had defined the relationship between environment and health and recognised how wellbeing and quality of life could be influenced by the physical environment (Zeisel, 2001). Sick Building Syndrome (SBS) is a phenomenon which Zeisel (2001) classifies as a feature of a *passive environment*.

Conceptual Framework

Additionally Zeisel (2001) explains that a healthy environment is *functional*, whereas a *proactive environment* offers optimal fulfilment, allowing for satisfaction, promoting quality of life and providing no discomfort. Calkins (2009) outlined design features which can improve the quality of life for people with dementia. Among these were higher levels of lighting can improve sleep, smaller dining room size which can increase caloric intake during mealtimes and private bedrooms which can improve sleep by reducing conflict between residents.

Many of these improvements in design were thought to be influential and reduce the need for drug therapy and high rates of staff turnover. Conversely, Shah et al (2011) found that antipsychotic drug prescribing was higher in care homes than in the community and was strongly associated with dementia in both cases so there is an even greater impetus for the physical environment to provide a therapeutic realm. Cutler (2007) further supports this stating a more domestic, non-institutional environment cannot merely be achieved through cosmetic features but must also be of a smaller size and scale. Quality of life (pleasure, activity and wellbeing) in residents with dementia is negatively affected by safety and security issues and enhanced by better orientation, controlled levels of stimulation, privacy, personal control within the environment, social interaction, cleanliness and maintenance (Cutler, 2007; Torrington, 2007). Burton and Sheehan (2010) emphasised Calkin's (2007) premise that natural settings have a positive effect on behaviour and that views to green space are important,. They further elaborate on this by explaining that open plan layouts are more accessible and practical for residents with dementia.



Figure 2-8: Long, narrow corridors are often found in nursing and residential homes where bedrooms are usually placed (Viva-lite, 2013).

These can create a labyrinth experience, making it difficult to differentiate one room from the next. This example also shows poor lighting combined with a bad choice of flooring for people with dementia as it is dark (can appear as a hole in the ground) and has a high sheen level which can appear as water on the surface.

2.5 Perception of space and wayfinding

The design of the physical environment and art within these homes have been accepted as viable ways to provide a therapeutic realm by reducing levels of anxiety and depression through stimulating the senses. Architectural design of mental health buildings was recognised as particularly important to support wayfinding, a common issue for people with dementia (Daykin et al, 2008). Passini et al (1998) posited that “wayfinding is the antithesis of uniformity”, suggesting that environments with a rich spatial experience can better support wayfinding. The physical environment should therefore provide unique or landmark features which act as spatial reference points to assist with wayfinding. This provides greater wayfinding cues than homogenous, uniform areas which are a common feature as a result of bedroom wings in long term care settings. The physical environment is significant for older persons with dementia in promoting quality of life and wellbeing because they are particularly sensitive to their surroundings (as identified in Section 2.3). A poor quality of life for residents which in part may result from a poorly designed environment was found to be associated with reduced orientation (Samus et al, 2005). Dementia leads to atrophy in wayfinding abilities, this is evident in the early stages of dementia, which can consequently affect independence and the completion of activities of daily living (Marquardt, 2011). This can impact negatively on the individual's wellbeing with dementia as they have a diminished ability to adapt to environmental stress. It is promising that in earlier work conducted by Passini et al (1998) that even in very severe cases of dementia there is some ability for wayfinding shown.

Dementia affects the individual's perception of the environment, impacting on spatial orientation as identified by Passini et al (2000) who wrote: “The first persistent signs of Alzheimer's disease (AD) are memory loss and reduced wayfinding ability”. This decline in wayfinding in people with dementia can cause negative psychological implications, affecting the wellbeing of the individual as a result of experiencing confusion, agitation and aggression. Work conducted by Passini et al (2000) identified that those with a cognitive decline tend to look at their feet when walking, so floor patterns can be confusing and even restrict movement. Problematic features of the environment have been linked with dark floor surfaces which are generally not walked upon.

Lifts and monotonous architectural compositions such as repetitive areas like bedroom wings can also cause confusion, while 'landmarks' or distinctive features help to improve orientation.

The impact of colour has not been fully evaluated to date, possibly due to the deterioration of eyesight through ageing. It may therefore be more pertinent to consider issues of glare, natural and artificial lighting and tonal contrast to help demarcate spaces.

Wayfinding is recognised as a persistent problem experienced by people with dementia even in the early stages of the disease. This section will discuss how perception of space is used to produce a cognitive map and enables success in wayfinding. Issues relating to a diminished cognitive ability affects accurate perception and therefore reduces wayfinding ability.

2.5.1 Experiencing through perceiving

Hall (1966) explains that individuals experience the world in their own way, therefore no two people relate to the world in the same way. The perceptual system allows for comprehension of the world, which enables observers to judge with conviction based on past experiences and knowledge to predict what might happen and filling in parts that are unseen (Vernon, 1982). Hall (1966) recognises that the ability to concentrate affects what is actually perceived and visual acuity can vary depending on factors such as gender, past experience and culture. Perception is therefore unique to the individual as they inhabit different sensory worlds.

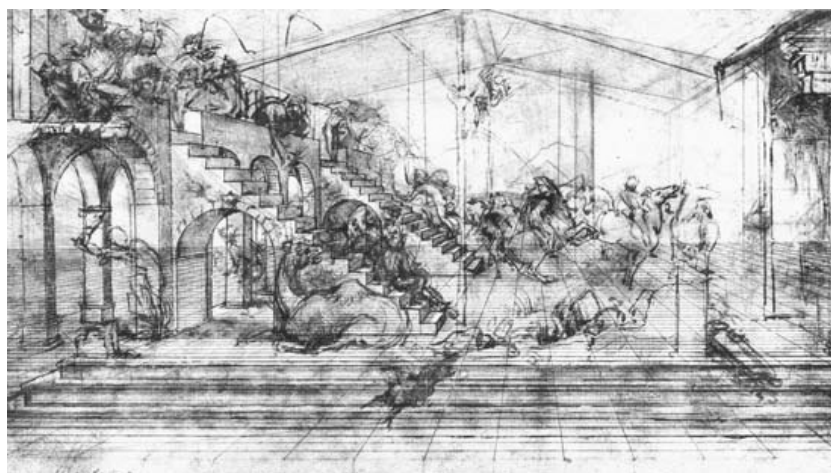


Figure 2-9: *Unfinished work by Leonardo da Vinci entitled "The adoration of the Magi" (Britannica, 2013).*

The imagination combined with human perception allows for successful prediction of the remainder of the picture.

Hochberg (1978) describes that in a world of objects, events in space, visual and auditory senses alongside other senses contribute to what is perceived. The brain uses information from the senses to interpret and trigger physiological processes. People perceive by adding sensations together or by interpreting them as one large set of entities (Hochberg, 1978). Downs and Stea (1973) explain that it is therefore important for the designer to acquire an understanding of how the spatial experience will be interpreted so that a successful architecture may incorporate a series of spatial ideas ~~(Downs and Stea, 1973)~~.

Space and the effect on human behaviour

Vernon (1982) explains that perception of space relates to the position of objects, this is important in avoiding collision and predicting movement in space. Form and physical shape play a role in human perception. Space has mathematical properties; physical distance is particularly relevant as it can influence behaviour and social organisation (Downs and Stea, 1973). The perception of space is affected by the organisation and proportions, for instance low ceilings can be oppressive (Vernon, 1982). Hall (1966) presents theories on furniture and spatial arrangement regarding how this can create sociofugal spaces which discourage conversation and sociopetal spaces which are designed to encourage interaction. Low lighting levels can affect perception, causing disorientation and becoming unaware where objects are (Vernon, 1982). Hall (1976) acknowledges that man responds to his environment with each of his senses and is able to store and retrieve multi-sensory information as well. This information is used in remembering and should be inherent in designing environments. Hall (1966) highlights that man's proxemic needs must be referenced in architecture as they are often neglected and this links with human behaviour in the physical environment.

Development of perception

People perceive through their senses which trigger brain responses to relate to past experiences or inferential processes. Spatial perception may result from learned experiences (Hochberg, 1978). Knowledge varies over time and space depending on factors such as age and the type of experiences that people have had in an environment (Downs and Stea, 1977).

Active spatial experience requires the individual to engage with their environment by walking, cycling or driving, whereas passive spatial experience is where the individual has been walked or driven around.

Active spatial experience contributes more to the learning of spatial environments as there is a more certain view of that world and it is less likely for people to become confused in it (Downs and Stea, 1977). This knowledge which is often rooted in past experience means that prediction can occur as there are expectations of events and environments. When these are not met, the individual may feel uncomfortable, insecure, surprised or annoyed (Vernon, 1982). Downs and Stea (1977) explain that the state of knowing enables comprehension of where to go and recognise that environmental learning is based on past experience.

2.5.2 Affordances in design: the significance for cognitive impairment

The term *affordance* was first coined by psychologist Gibson (1977) who defined it as the interaction between the user, object or environment and the possible action. The action is linked to how the object or environment is designed and *affords* itself to the user. For instance, a door knob affords a turning action. Perception of the environment was identified as a key factor of design, to offer affordances to the user (Norman, 1988). Gibson (1979) theorised that affordances offer the possibility of action as a result of the physical properties of the object (or space) and the ability of the user. Gibson's ideas were developed as it became evident that user perception and interpretation are important in action capabilities (Norman, 1988; Turvey, 1992; Chemero, 2003). Perceived affordances exist in a three-way relationship, this includes the user, environment and action (Figure 2-11). This implies that an adequate design should not require the user's memory, inference or further interpretation and that affordances are a key factor in design. How things are perceived depends on the senses and cognitive capabilities of the individual (Lee and Chang, 2007). Dementia results in cognitive decline and therefore affects the perception of the physical environment.



Figure 2-10: Coffeepot for masochists by Jacques Carleman (Norman, 1988).

This image illustrates that affordances allow for correct identification of objects and ease of use.

Work conducted by Giovannetti et al (2007) showed that when items were ordered for people with dementia, performance on everyday tasks improved. This was successful as it facilitated or afforded the user in carrying out the process at hand. A similar approach could be taken with regards to the design of a building, involving a natural progression which leads residents to and from spaces without the need to examine where to go. In this instance, the theory on clustering units in order to improve orientation on a smaller scale environment is relevant (Wilson, 1993; Day et al, 2000, Verbeek et al, 2009). Although smaller scale environments have been mentioned as a positive feature on many occasions, Samus et al (2005) highlighted that there is some conflicting evidence to suggest that quality of life was observed to be lower in smaller dementia specific facilities than in larger non-dementia facilities. As it is difficult to compare facilities which cater for different needs as well as the impact of their scale, it stands to reason that smaller scale environments would be easier to monitor and produce a more homely atmosphere. However the evidence regarding size is neither clear nor significant (Samus et al, 2005).

Conceptual Framework

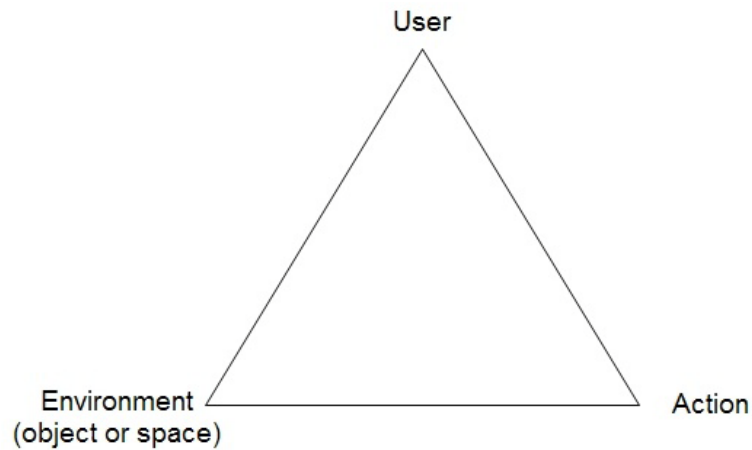


Figure 2-11: Perceived affordances.

The three-way relationship shown in this diagram indicates how perceived affordances are determined by the user, the environment (object or space) and the action.

2.5.3 A sensory experience

The senses and perception: ocular centricity and the need to appeal to other senses

Hall (1966) explains that there are two different perceptual worlds, the first is sight orientated (friendly but unpredictable) and the second is touch orientated (more immediate and friendly). The senses are used to comprehend the environment as part of the human-environment interaction. The sensory receptors are used to detect patterns naturally, although this is not believed by Hall (1976) to be a form of intelligence. The transition between senses and the brain is crucial in understanding mankind (Hall, 1976). Downs and Stea (1973) discussed psychological work on geographic orientation which suggested it is not intellectual when a sense of direction is maintained in an unfamiliar setting, whereas it is intellectual, when for example, finding where north is or drawing a route on a map. Orientation relates to a visual process so sight loss (depending on what age it occurs) can have a significant impact. Cognitive decline reduces wayfinding ability and orientation (Downs and Stea, 1973).

Hearing, smell and sight are distant senses and perception may be affected by visual defects, altering the ability to see colour, shape, light and visual acuity (Armstrong, 1966; Hochberg, 1978). King et al (2001) explain that sources of sound can act as spatial cues producing a response in the sensations. Sensory information is subjective and Armstrong (1966) states that it does not exist, unless it is perceived. Again it is believed that previous experience contributes, making perception conscious or immediate (Armstrong, 1966).

Loss of sight can cause environmental deprivation, so the person's perceptual memory may be used to substitute immediate perceptual experience. Downs and Stea (1973) explain that some detail may be missed but over time cognitive maps may be produced as cues (such as tactile information) which are frequently ignored by sighted people. The skin gives immediate knowledge of shape, size, temperature and spatial relationships within the environment. Skin may be classed as both an immediate and distant receptor (Hall, 1966). The qualities of the skin are overlooked and relate to the perception of space. It is also considered to be important in communication.

Touch and vision are interwoven. The visual field separates objects and the tactile field separates the viewer from objects, together they enable understanding of space. Texture can be appreciated by touch (even when visually presented). Designers have failed to grasp this and have not understood its importance (Hall, 1966). The sensory shift relates to the importance placed on sight (Hall, 1966; Vernon, 1982). Design in reference to loss of sight and hearing (commonly associated with ageing) must therefore consider a multi-sensory experience.

2.5.4 Cognition of the physical environment

Spatial orientation and wayfinding: instinctive or intellectual?

Downs and Stea (1973) highlight the work of Descartes who believed that space is an innate idea before it is experienced. However influential work from Kant and Piaget suggested that spatial cognition is a learned process which requires adults to obtain knowledge about objects and their movements in the physical environment (acting in space rather than perception of space). Ideas and images are integrated with human perception and are used as a skill to interpret, often without any awareness and this only becomes appreciated when the ability to do this is lost or does not develop properly (Vernon, 1982).

Wayfinding is the basis of orientation and uses purposive movement which is considered important for human survival as it influences human environmental behaviour. While it appears that people are adept at wayfinding, it seems to come naturally and is an unconscious experience, it is not innate, inherited or primitive, but is learned. Although some may be better at it than others, this is believed to be the result of superior learning strategies (Downs and Stea, 1973; 1977). Wayfinding uses a novel sequence and global knowledge, resulting in the production of a cognitive map based upon landmarks (Hartley et al, 2003).



Figure 2-12: Piazza Navona, Rome.

Place is defined by Cullen (1961) as a space with a purpose, such as social or business and it implies inhabitation or a possession. Landmarks like the obelisk create focal points and help to trigger memory of place.

Getting lost: capacity and cognition of the physical environment

The original function of the environmental image (Figure 2-13) is for wayfinding or to permit purposeful movement. Lynch (1960) recognises the consequences can be undesirable if the skill of wayfinding is lost either through confusion or cognitive impairment such as dementia:

"To become completely lost is perhaps [...] rare [...] but let the mishap of disorientation occur once and the sense of anxiety and even terror that accompanies it reveals [...] how closely it is linked [...] to wellbeing [...] it carries overtones of utter disaster [...] One man recognises a room by a small sign, another knows a street by the tram car numbers. If symbols are tampered with man is lost [...] in a curious fashion, the way in which we proceed in an unfamiliar city [...] The terror of being lost comes from the necessity that a mobile organism be orientated in its surroundings." (Lynch, 1960)

Conceptual Framework

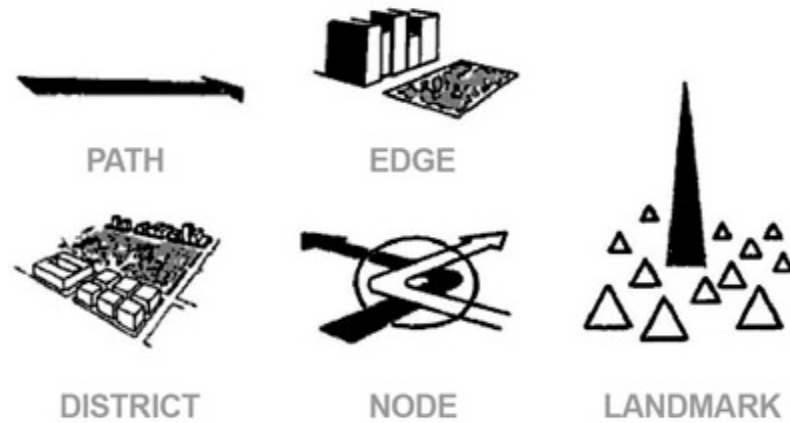


Figure 2-13: The five elements which combine to produce an environmental image (Lynch, 1960).

Lynch (1960) theorised that navigation occurs using cognitive maps which produce an environmental image.

Torrington's (2009) description of a person with dementia getting lost reads:

"In terms of the physical environment it means that a person may find themselves in a space with no memory of how they got there. This requires them to continually interpret the space they are in to derive an understanding of where they are and what they should be doing. The linkage of space and actions and the behaviour of the people in it is a phenomenon that affects everyone."



Figure 2-14: The "Dementia star" simulates difficulties experienced with perception and orientation (Image acquired from housing association linked to fieldwork site three and completed by the author).

This task is conducted whilst looking in the mirror but never at the paper whilst drawing the star shape between the lines. Difficulty was experienced on the right hand side of the drawing and is shown in this tracing, suggesting weaknesses with the left hand side of the brain as compared with the better performance on the left as a result of the right hand side of the brain.

The capacity to perceive is affected by the individual's ability to concentrate and the homogeneity of environments which can reduce the ability to remember significant features and perceive accurately (Vernon, 1982). Downs and Stea (1973) propose that the environment is an intellectual construct validated by the inherent interaction between the organism and the environment, which creates a nature of reality based on people's own assumption that they perceive accurately.

Vernon (1982) proposes that the understanding of spatial and temporal relationships of objects in space is dependent on individual capacity, recognising that brain injury and cognitive decline can lead to deterioration in spatial perception. Visual connections are seen as a way of assisting wayfinding by Tzortzi (2010) who explains that it encourages a global rhythm of perception enabling other parts of a building from a different point.

2.5.5 Finding a way

Spatial cognition: finding places

The conceptualisation of places is formed by environmental cognition and represented in cognitive maps (Hock, 2008). Downs and Stea (1977) explain that cognitive mapping is a form of spatial problem solving which is relied on in an environmental context. Cognitive maps are part of everyday lives which are often overlooked or taken for granted, they are formed through a process of psychological transformations used by the individual to store information about their relative locations and phenomenal attributes of their everyday spatial environment (Downs and Stea, 1973). Characteristics can contribute to the 'whereness' [*sic*] of a place and reduce the area which is searched. Spatial frames are used for reference as an experiential skeleton of experiential knowledge around and create a legible picture of the surrounding world. This considers signs or cues within the environment, where they are placed and how they are learned to use them effectively (Downs and Stea, 1977).

Downs and Stea (1973) explain that cognitive mapping applies information about the nature of a spatial environment regarding the relative location of people and objects within the environment. It is essential for decision making and is a process which will change with age or development through learning. Environments are complex and influenced by phenomena. The term 'cognitive maps' was coined by Tolman (1948) and it relates to environmental learning and visual thinking.

Environmental learning is dependent on environmental experience which means the design of the physical environment will have implications on this. Spatial learning and thinking are informed by sensory inputs which lead to spatial representation and cognitive mapping. The dominance of sight has been recognised by Pallasmaa (2005) and plays a major role in spatial behaviour which may be linked to the mental images man holds of space (Lynch, 1960; Downs and Stea, 1973).

The act of wayfinding

Classic orientation experiments, such as those conducted by Tolman (1948), using rats identified that there is a capability of producing a spatial map which is comprehensive and show that training was not significant and routes may be recalculated should the conventional way become blocked. His work revealed that optimal conditions for spatial orientation in the real world are similar to the maze and should include moderate motivations free from unnecessary frustrations. This work has been repeated several times and recent work by Hartley et al (2003) who proposed that following routes in large scale environments requires more complex cognitive processes than in familiar environments.

Egocentric (person-centred) and allocentric (or geocentric: relating to the surrounding environment, this information is used in parallel to improve wayfinding accuracy) information are important in spatial cognition and orientation (Burgess, 2006). The extent of an individual's perception is affected by the interference of the position of the body in space which will be informed by visual and body sensations; these relate to balance, gravity and muscle sensations (Vernon, 1982).

Downs and Stea (1973) argue that people are profoundly influenced by the surrounding environment, as it is linked with knowledge which can enable prediction of what might happen next. The perceptual process results in the successful outcome of knowledge of location in space (spatial orientation). The cognitive process is a decision making process, consisting of: prediction, evaluation and action and this enables determination of patterns which are important in spatial representation.

Conceptual Framework

The four types of knowledge which Downs and Stea (1973) considered to be critical are:

- Where one is (this is critical for adaptive behaviour and requires the perception of present stimulus and preceding events).
- What is likely to happen next (man is not a “tabula rasa”, as previous experience enables prediction of events likely to occur).
- Whether the outcome will be good or bad (this form of evaluation is critical in decision making).
- Possible courses of action (it is important to possess the ability to make quick decisions for efficiency and to understand there may be a personal bias towards certain actions).

Topographic orientation is the knowledge held by people who know where they are now, where they are going and information of their immediate surroundings. This enables orientation and the preservation of success in general everyday life (Downs and Stea, 1973). Spatial image was a term first used by Lynch (1960), which relates to the more general term cognitive representation. Downs and Stea (1973) explain that the image is used to interpret multi-sensory information and guide action. This is a two-way process between the observer (the person) and the observed (the environment).

Visual and non-visual (sensory) cues are utilised during wayfinding, including auditory and kinaesthetic maps during the orientation process. The frustration of getting lost is often associated with ambiguous signs and the consequences of following the wrong direction can be severe and compounding. Orientation is frequently discussed but it is difficult to provide a solution to this common problem. Humans need to distinguish cognitive orientation from perceptual orientation which is the awareness of the body in space.

Orientation is the knowledge of where one is and where one is going, either in time or space or in relation to a confusing problem (Downs and Stea 1973). How a person refers to past memory and learning during the process of wayfinding was highlighted by Downs and Stea (1977). Choosing the route, keeping on the right track and discovering the objective are part of orientation. The cognitive inferential process uses cues and cognitive capacity to perceive or learn for problem solving.

There is more to wayfinding than following the shortest or easiest route as the shortest physical distance or time is not always the fastest or safest (Downs and Stea, 1977). The next section summarises research gaps and presents methodological considerations.

2.6 Gaps in the literature and research

It is evident from the literature review that there is a need to extend the evidence-base which may be used to inform design guidelines for dementia specific nursing homes and residential care homes. The physical environment needs to become more inclusive, not solely limited to resolving mobility requirements but consider other impairments, such as sensory and cognitive problems with particular reference to wayfinding. The comprehensive literature review mapped the extent, range, nature of current and existing research in the area of design of long term care facilities for people with dementia. Gaps in the research were manifest in the literature and these were also recorded. This section highlights the gaps which were identified from the literature review and indicates which areas require greater attention and proposes directions for the research to take.

A range of good practice guidelines exist for the design of dementia-friendly environments. However, design tools and guidelines frequently rely on experimentation due to the lack of research based evidence (Smith et al, 2004). Fleming et al (2011) argue that little is certain when it comes to the design of dementia-friendly physical environments. The ageing process is linked with the onset of dementia and sensory impairments which is neither understood nor addressed in terms of the design of the physical environment (Croucher, 2008). O'Malley and Croucher (2005) and Tribal et al (2006) confirmed this by referring to the lack of housing options for those with dementia and argue that this has been partly caused by the fact that dementia, housing and ageing in general are looked at as separate issues.

2.6.1 Methodological considerations

Methodological issues have caused previous studies to be inconclusive as identified by Guite et al (2006), many of the research has a weak methodology or was not cross-sectional. This is supported by O'Malley and Croucher (2005) who believe many research articles looking at dementia care and housing are limited and present inconsistent data. O'Malley and Croucher (2005) highlighted that qualitative research has a greater potential for improving the understanding of the context.

2.6.2 Sample sizes

Sample sizes were often too small and need to be increased to create comparative longitudinal studies and current work does not address appropriateness of accommodation types for those with dementia. Studies need to be more rigorous in recording demographics and involving people with stage appropriate dementia (O'Malley et al, 2005). Although research in this area has been growing, particularly since the 1980s (Figure 2-3, p.20), Calkins (2009) argues that many of the studies are small or single sites and are difficult to compare.

2.6.3 Adding to the existing knowledge base

Design guidelines for dementia have accumulated in recent years but Parker et al (2004) proposes that their impact is unknown. Evans (2003) identified that there is a small body of knowledge on design for dementia in care facilities and institutions. Algase et al (2011) recognise the lack of studies on the effect of crowding in dementia care settings. Further investigation is also required on dementia specialist care facilities and the impact on quality of life as assessing this can often be subjective (Reimer et al, 2004). Borbasi et al (2006) states that future work should involve stakeholders to develop best practice. This is a sentiment shared by Powell Lawton (2001) who noted the value of involving non-designers who can inform the decision making process of design. There is a lack of empirical studies on design to support wayfinding in dementia. It has been suggested by Calkins (2009) that designers would benefit from an information source based on compiling numerous research projects into a single resource.

Emerging evidence suggests that smaller scale, non-institutional/home-like finishes, space for wandering, increased levels of daylight, control of stimuli (especially noise), provision of cues for wayfinding, consideration of furniture arrangements (to promote social interaction) and access or views to green space are all contributors to good design for people with dementia.

Zeisel (2001) explains that the brain has been subject to intensive study for centuries; however the link to environmental design is only as recent as the 1980s. There is therefore greater scope for this research to determine how the physical environment contributes to wellbeing and quality of life.

2.6.4 The issue of wayfinding

The literature review revealed that there is limited knowledge of wayfinding in larger non-domestic environments such as nursing or residential care homes. There has been a lack of emphasis on the importance of specific design for dementia in long term care facilities, resulting in buildings which are inappropriate or ill-equipped in terms of design. This needs to be addressed to provide more conducive environments.

Marquardt (2011) identified that only five studies were found to examine architectural floor plans. There is a need to better understand the relationship between human behaviour and architectural design. Evidence-based design is necessary as people with dementia are less able to adapt to environmental stress. Powell Lawton (2001) explains that there is merit in design for dementia as it can be positive for those without dementia. By understanding these issues it is hoped that informed guidelines for the design of long term dementia care facilities may be determined. Currently there is not a full appreciation of the impact of the application of certain design guidelines and whether they are beneficial, as Fleming and Purandare (2010) suggested: "It may be too early to argue for the provision of definitive guidelines for the design of long term care units for people with dementia." There is an obvious need for more research on the design of long term care environments for people with dementia in order to establish a more robust evidence-base which may inform the current design recommendations.

2.6.5 Compliance with existing design in Northern Ireland

The Dementia Essential Criteria (Cunningham et al, 2008), developed in collaboration with Health Facilities Scotland and the DSDC at the University of Stirling, provides a practical tool to audit Dementia units. This tool has a checklist and a section on General Design Principles which provides a valuable basis for use as a briefing tool for designers of new facilities (DSDC, 2007). There are a range of other existing design recommendations similar to DSDC's, such as the Professional Environmental Assessment Protocol (PEAP) tool which was developed to provide a standard method of evaluation of dementia units. These tools look at design for dementia generally and while this research examines design, the focus will be on aspects relating to wayfinding.

PEAP is widely used as an environmental measure but similar to the DSDC guidelines it is still undergoing psychometric development. One of the main issues linked with these tools as suggested by Smith et al (2004) is that some of the guidelines are based on subjective evidence. Particularly relevant to dementia and ageing is the need to consider sensory impairments within the design process (including multiple impairments), although this is frequently ignored or not understood (Croucher, 2008).

This thesis is based within the context of Northern Ireland, however, it was important to look at precedents which were highly regarded in terms of design. Exemplary designs of long term dementia buildings were identified and studied as part of the research. Although these are specific to each of the countries and their cultural peculiarities and so may not be transferable. However design principles are still relevant and lessons can be taken from these.

2.6.6 Critical review of existing work

Previously in Section 2.6, gaps were identified in relation to methodological considerations, sample sizes and current design guidelines in relation to wayfinding for people with dementia. Research on design for dementia is relatively recent, with a growth in interest from the late 1980s. This section will now critique the gaps in the key work identified in the literature review and indicate which direction the research will take.

It was identified that there is a dearth of knowledge in relation to examining the architectural floor plan of long term care settings for people with dementia. This is critical in understanding how spatial configuration and layout impact on wayfinding for people with dementia.

The earliest known research on this was conducted by Netten (1989). Her work was based in 13 nursing homes and involved staff rating the wayfinding ability of 104 residents. The staff identified which routes the residents could find by themselves and which routes they required assistance with wayfinding. Netten (1989) rated each of the residents. This work was a landmark study in terms of identifying areas of design which help or hinder wayfinding. Small scale, simple design, reference points and places with obvious different functions were supportive of orientation, whereas long corridors, repetitive elements and large numbers of exits can all cause disorientation.

The limitation with Netten's research is that it relied on the staff to rate the wayfinding ability of the person with dementia. Staff opinion may be biased and lack the detail and reasoning for why certain areas support or cause problems with wayfinding.

Work by Elmståhl et al (1997) was similar to Netten's work in that both did not involve people with dementia but instead relied again on staff assessment. Their study involved examining 105 people with dementia living in long term care settings over the course of one year of moving in. Assessment occurred over three stages: when they moved in, six months later, and finally one year on. Staff assessed behaviour perceived to be challenging and linked to wayfinding using the Organic Brain Scale. They also rated features of the physical environment using the Therapeutic Environmental Screening Scale. This was used to evaluate design, space, lighting and noise. Where Elmståhl et al (1997) elaborate on the work of Netten (1989) is the identification of route types in conjunction with plan typology. They found that those living in a corridor or linear plan were more confused after one year than in any other plan type (including the circuit and H-shape plan), whereas those living in the L-shape plan were less disorientated after six months.

Although Elmståhl et al (1997) had made advances on work by Netten (1989) by including plan types, their work unlike that of Passini et al (1998; 2000) failed to involve people with dementia in their research. The work of Passini et al (1998; 2000) was another benchmark as it involved an observed wayfinding task which involved people with dementia. For instance, the aim of the 1998 study was to see what ability people with dementia had in finding their way from a bus stop outside a hospital to the dental department. This involved the use of vertical circulation and was the first to conclude that lifts and stairs were confusing for people with dementia. The researcher walked alongside the participants and provided help with finding their way when required. A total of 14 people with dementia completed the walks alongside a control group which consisted of 28 people without dementia. Their performance was also assessed on return walks and it was determined that those with dementia had reduced cognitive mapping abilities which impairs their ability to develop an overall wayfinding strategy. Therefore the design of the physical environment, including environmental cues and the spatial organisation are important in promoting wayfinding for people with dementia (Passini et al, 1998). Passini et al (2000) used the same methods in one nursing home with six participants with dementia.

They also conducted semi structured interviews with 10 staff who had worked at the home for more than four months. They concluded that even those with severe stages of dementia could find their way if the environment was supportive and designed appropriately (Passini et al, 2000).

Both studies by Passini et al (1998; 2000) revealed that signage, visual access, simple layout, landmarks and clear and distinct locations could help to compensate for the loss of memory or spatial understanding. Narrow and long corridors and uniformity were undesirable. The contributions by Passini et al (1998; 2000) to research on wayfinding for people with dementia was notable. However, there are a number of limitations with these studies because these did not consider a range of route types within the architectural floor plan of the nursing home (Passini et al, 2000) and were conducted on single sites and on a one off basis.

Mitchell et al (2003) used similar observed wayfinding walks to Passini et al (1998; 2000). This involved 13 people with dementia on accompanied walks within their neighbourhoods. Mitchell et al (2003) incorporated conversational style interviews with the person with dementia. However, this research was focused in the context of the outdoor environment and therefore did not examine the impact of the design of long term care settings. Lessons can be taken from both Mitchell et al (2003) and Passini et al (1998; 2000) with regards to a more meaningful participation for engaging people with dementia directly in research. It is important to involve the person with dementia and not rely solely on the opinions and views of surrounding stakeholders. The use of conversational style interviews provides the person with dementia with the opportunity to express their views and perspectives, whilst the accompanied wayfinding walks provides in depth behavioural data which relates to how the person with dementia responds to the surrounding environment.

More recently, research by Marquardt and Schmieg (2009) returned to the methods used by Netten (1989) and Elmståhl et al (1997) by asking nurses within 30 nursing homes to rate the wayfinding ability of 450 residents. Staff scored zero when a person was unable to find their way, one when they could partially find their way but would require help and two when they were able to independently find a location. Despite this being a large sample size, this is considered a step backwards as it excludes direct involvement of the people with dementia.

The staff may lack the knowledge to accurately describe the wayfinding performance of the residents. Marquardt and Schmieg (2009) categorised plans as linear, L-shape or circuit/courtyard type plans. In contrast to Elmståhl et al (1997), Marquardt and Schmieg (2009) posited that the linear plan was better for wayfinding as there were fewer changes in direction which resulted in reduced disorientation.

Many of the other findings by Marquardt and Schmieg (2009) concurred with Netten (1989); Elmståhl et al (1997) and Passini et al (1998; 2000) as it showed that long corridors, dead ends and repetition should be avoided, whereas landmarks and outdoor space were beneficial for wayfinding.

Proposed course of action in response to the gaps

The disparities in these findings provides scope for further investigation, along with the dearth of research and the gaps in relation to methodological approach and the examination of the architectural floor plan. A number of gaps have therefore been identified, these include:

- People with dementia should be directly involved in the research as participants to provide their perspectives and views on the design of the physical environment.
- The use of appropriate methods should enable meaningful participation.
- A range of architectural plan types should be included to represent the design context of nursing and residential homes.

Research by Passini et al (1998; 2000) and Mitchell et al (2003) is the most relevant in terms of developing a methodology that adequately engages with the person with dementia. Shortcomings of their work and potential areas of improvement relate to single site and one off observations. These should be repeated to test variability and performance over time. The benefits of a repeated measures design has been identified to overcome this issue. In terms of this use of single sites, case studies should be used to provide a range of typology designs that is representational of long term care settings. Mitchell et al's (2003) use of conversational style interviews should be incorporated into the research to facilitate eliciting responses from the people with dementia.

Sample sizes were discussed in Section 2.6.2 and there was an emphasis on the need for larger sample sizes. The work of Netten (1989), Elmståhl et al (1997) and Marquardt and Schmieg (2009) involved sample sizes which examined more than 100 people with dementia. However, they relied on staff rating the performance of the residents. It is preferable to follow the approaches of Passini et al (1998; 2000) and Mitchell et al (2003) who used more appropriate methods to involve people with dementia in the research. This provides richer, in-depth, qualitative data and is more relevant to gain a better understanding of the person-environment interaction. The described landmark studies are key pieces of work and have been influential in the development of the research design.

2.7 Summary

An ageing population has created new challenges for design of the physical environment. Consequently, there is more of an awareness of the role the physical environment has in maximising mobility and inclusivity. This chapter presented perspectives and theories from the literature on the design of long term care facilities for people with dementia. The study mapped the extent, range and nature of current and existing research in the area of design of long term care facilities for dementia patients.

The physical environment is a widely recognised issue known to impact on the wellbeing, quality of life and independence of those with dementia. It may compensate for cognitive and physical frailties and alleviate symptoms associated with dementia (Bonner, 2005). Health and safety features were considered undesirable and “home-like” environments were received more positively. The physical and social environments must be considered together to achieve optimal results. Dementia affects how the environment is perceived so design and consideration of affordances is important because the illness means that people become particularly sensitive to their surroundings. Dementia affects wayfinding, behaviour, levels of stress, anxiety and agitation.

This growing area of research has been criticised with regards to methodologies used, sample sizes described as too small, single-site studies that are not cross-sectional. It was highlighted that data should be recorded more consistently and be rigorous in recording demographics. Gaps in the research were identified which included the need to use appropriate methods to meaningfully involve people with dementia in the research and the dearth of studies which have scrutinised the architectural floor plan in terms of wayfinding.

Conceptual Framework

There are a limited number of studies which have focused on the architectural composition, or which have examined the floor plan. Qualitative research was identified as an appropriate avenue to explore attitudes and provide a better understanding and reveal a different perspective. Research should also involve stakeholders to develop best practice. The emphasis on good design for dementia in the long term care facilities is linked with the fairly recent new phenomenon of a growing ageing population and the incidences of dementia. The benefit of the current design guidelines is still unknown and although many design recommendations concur, not all are definitive and the evidence-base is not strong enough.

Additional research is required as people with dementia are more sensitive to their surroundings and are less able to deal with environmental stress. This is significant and emphasises the importance of establishing a more robust evidence-base which may inform existing design guidelines.

Ecological theories on affordances, in particular the relationship between the user, environment and action capabilities are significant, allowing for cognition through an understanding of aesthetics, semantics and symbolism of a space. Ageing and the effects of dementia alter cognitive processes, so affordances are important to consider within the design of the physical environment. This will be considered within the issue of how architectural design impacts upon wayfinding for people with dementia. There is also a need to provide a better understanding of the relationship between the behaviour of people with dementia and architectural design and to develop a greater evidence-base. The terms “nursing homes and residential care homes” will be used throughout this thesis to refer to “long term care settings.” This thesis will focus on wayfinding for people with dementia living in larger scale nursing and residential homes in the context of Northern Ireland. It will examine the design of the physical environment in reference to this and consider which features support or inhibit wayfinding success.

The next chapter will introduce the research design and methodology which has been used in this thesis.

Chapter 3: Methodology

3.1 Introduction

The aim of this chapter is to explain the development of the research design to implement methods which successfully allow for participation from residents of nursing and residential care homes with dementia. This discusses the evolution of the research design through the consideration of ethical issues, sampling procedures, challenges in engaging in research with people with dementia, gaps and issues identified in the literature review and the design of interviews and wayfinding walks.

A theoretical framework which covers the various facets of the research design was adopted to enable consideration of framework elements throughout the development of a proposal. According to Creswell (2008), this should include the philosophical assumptions which constitute knowledge, the strategies of enquiry and the detailed procedures (or methods for data collection and analysis).

Epistemology is related to the theoretical framework and influences the strategies of inquiry, methodology and analysis. The three approaches to research design are quantitative, qualitative and mixed methods. It is acknowledged by Flick (2008; 2011) and Willig (2008) that the relationship between epistemology and methodology is such that only certain research methods are compatible with methodology. The importance of applying a mixed methods approach which combines qualitative and quantitative methods has been more recent than the well established quantitative research used in social sciences for years and qualitative research which has come more into fruition over the years. A pragmatic epistemological approach was therefore adopted as it complements a mixed methods approach and allows for a reflexive process and a freedom of choice of methods to satisfy the various elements of the study.

A mixed methods approach was identified as appropriate for this study to provide a better understanding of the research problem. Mixed methods are employed to overcome bias, provide rigour, different viewpoints or interpretation and as a recognition of the limitations of single methods (Leedy and Ormrod, 2004). This creates a triangulation which can facilitate insight from one method informing other methods as argued by Denzin (1978) and Groat and Wang (2002). This can improve the quality and reliability of the research through offering multiple perspectives from the various methods employed and demonstrating where one method can compensate for the deficiencies of other methods.

Marshall and Rossman (2011) proposes that the notion of triangulation may be extended to provide a crystallisation by considering individual method's qualities and shortcomings when developing a research design. Mixed methods can result in sequential, concurrent or transformative procedures. Sequential procedures allow for elaboration on one method with another, whereas concurrent is when both qualitative and quantitative data are collected at the same time, before being integrated and interpreted comprehensively. The research within this thesis applies transformative procedures as it uses both sequential and concurrent procedures within a theoretical framework. Case studies will be used as they combine multiple procedures for data collection (such as interviews and ethnographic observations) through a mixed methods approach and can provide a holistic understanding of the entity and allow for determining possible causes of behaviour (Zeisel, 1984). The advantage of case studies enables in-depth exploration of fieldwork sites, over a limited period of time and studying particular activities. Creswell (2008) argues that the selection of methods can be determined by the research problem. The rest of this chapter explores what methods will be used to conduct the research and the rationale behind them.

3.2 Method of conducting the literature review

A comprehensive literature review was conducted to search and analyse existing literature to highlight other research, theories on the issue under study and determine relevant methods to use. The focus of the literature review was based on the context of existing research into the design of long term dementia facilities and was intended to answer a defined research question and identify gaps in knowledge. The initial process of the review was to determine research questions, keywords to provide wide definitions and prevent overlooking results (Arksey and O'Malley, 2003). It was also important to consider terminology used in other countries to include international results, for example "residential home" and "care home". The primary research question was defined as:

"How does the design of the physical environment in long term care facilities affect residents with dementia?"

Secondary research questions were:

"To what extent has current research addressed design issues for people with dementia in long term care facilities?" and

"What research gaps require focus in future inquiry?"

Inclusion criteria were then defined a priori to identify relevant work, this was identified as important by Higgins and Green (2011) and Kahn et al (2003). At this stage keywords and terms were selected in relation to this subject and included: dementia, architecture, design, physical environment, housing, nursing homes, care homes, quality of life and wellbeing. An electronic search using computer databases (including Avery Index to Architectural Periodicals, Compendex, Web of Science, Zetoc: Electronic Table of Contents and Google Scholar) was completed using the keywords to find relevant journals and articles. A manual search was then conducted and returned large numbers of articles in a comprehensive results list. This was then refined by assessing the quality of the studies according to the protocol by further examining the papers content which was explicit in the synopsis or abstract and evaluating whether it had been determined as a landmark study in other relevant literature. In addition to this, studies which explored heterogeneity and had the strength of inferences were included to establish future areas of research. The selection of the studies was informed based on the procedures described and was intended to create a broad range of results. Studies were appraised using standard critical appraisal tools (available from Critical Appraisal Skills Programme [CASP]) which assessed the quality and identified irrelevant papers which were also omitted based on the inclusion criteria (CEBM, 2005). Data from the literature was then recorded by sorting the material into themes and key issues were summarised.

The main findings from the literature review indicated a paucity of studies examining the architectural plan (Marquardt, 2011). Evans (2003) recognised that there is a small, growing body of knowledge on design for dementia in long term care facilities but according to Parker et al (2004) and Fleming and Purandare (2010), evidence is not definitive and the impact of recommendations and guidelines is not fully known. Methodological issues were highlighted within the literature review by O'Malley and Croucher (2005), Guite et al (2006) and Calkins (2009), who suggested that previous studies were inconclusive, limited and inconsistent. This was due to small sample sizes, single site studies, the lack of involvement from people with dementia, poor recording of demographics to allow for comparison and the need for longitudinal studies. The potential for qualitative research was also highlighted as it was posited by O'Malley and Croucher (2005) that it could provide a better understanding of the human-environment interaction in the context of dementia. With particular reference to wayfinding, Passini et al (1998) stated that it is the "antithesis of uniformity,"

implying environments with a richer spatial experience are better at supporting wayfinding. In conclusion, this indicates the role of evidence-based design and a need to involve residents with dementia in the research to provide a greater understanding of the environmental issues. It is expected that this would inform and supplement the evidence-base for the current design guidelines, particularly those associated with wayfinding.

The identification of research gaps and methodological issues during the literature review provided knowledge and background, thereby allowing for these considerations to be taken into account during the selection of appropriate methods and the development of a research protocol. Consequently a mixed methods approach was selected to provide a triangulation. It was decided that semi-structured interviews with next of kin and staff in the nursing or residential homes would be used in conjunction during observed walks with residents (wayfinding task). Additionally spatial analysis would be conducted by using suitable Space Syntax methods, including Visual Graph Analysis (VGA) and avatar based simulation analysis as identified by Penn (2003) and Stonor and Stutz (2004). Further detail on why these methods were selected and how they were implemented as part of the research follows in this chapter (see Section 3.6.2).

3.3 Preparatory work and pilot studies

In preparation for completing ethical approval and before commencing fieldwork, it was identified that trials and piloting the methods was important to identify any ethical, technological and methodological issues, as well as becoming competent at dealing with large amounts of collected data which would then require analysis.

3.3.1 Trials

The wayfinding walks were designed to incorporate ethnographic methods by using direct observation and provide an in-depth understanding from the perspective of the person with dementia as identified as appropriate by Powell Lawton (2001). A behavioural mapping sheet was informed by the work of others, including Sommer and Sommer (2002), Brooker and Surr (2006), Cohen-Mansfield and Libin (2004) and Edgerton et al (2010). This was then developed and trials were completed in the David Keir Building at Queen's University Belfast with young healthy adults. The purpose of this was for the researcher to acquire skills relating to handling data (collection, recording and analysis).

This also provided the opportunity to test the equipment and ensure any technological issues were addressed (Table 3-1).

List of equipment used during the wayfinding walks	Purpose (recording)
Clipboard with building plan, a set of debriefing questions and blank paper.	Route, behaviour, verbal responses.
Vicon Revue lanyard cameras (one for researcher and or one for participant).	Egocentric views of physical environment (what is seen).
Mobile phone (with video camera recording)	Video: images of physical environment, conversation, responses, location (distance and route), time and behaviour.
Dictaphone	Verbal responses and conversation.

Table 3-1: A list of equipment trialled during the pilot stage of the wayfinding walks and what each item was used to record.

Amendments resulting from the trials

Some issues were pre-empted before the trials were conducted, such as the logistics of carrying so many pieces of equipment and being able to ensure they were all operating properly. Using a clipboard and having the Vicon Revue camera worn as a lanyard reduced the amount of items needing to be held during the walks and a carry case with a clip was purchased to hold the mobile phone. After the trials it only became clear that the sheer amount of data collected for one walk was difficult to manage. It was decided that the Dictaphone was not necessary as the mobile phone video was already recording conversation or verbal responses and it was linked to a timeframe along the route or during briefing or debriefing. It was decided that the researcher would wear a Vicon Revue camera as well as asking the participant to wear one in case the participant did not wish to wear one. Table 3-2 shows a table which was developed for the data from the walks which included qualitative data (relating to conversation and behaviour) and quantitative data (distance, time, speed and point on plan). Ethical issues relating to anonymity were raised during the trials as it was noted that images from the Vicon Revue camera may record other people within the environment. This was acknowledged in the preparation for ethical approval and images were made indiscernible by blurring and pixelating these (see Figure 3-1).

Methodology

Behavioural mapping

Fieldwork site 2: Participant 4: Walk 1 (F2_P4_W1)

Distance (m)	Time (s)	Speed between points (m/s)	Colour	Point on plan	Conversation	Behaviour
Outbound						
0.0	0	0.00	Blue	1	<p>R: So P4 I'd like you to walk to the parlour with me today, X's room.</p> <p>P4: The fancy room down the corridor or the other one?</p> <p>R: That's right the one down the corridor with all the nice furniture in it.</p> <p>P4: Oh aye the fancy one...well you keep me right.</p> <p>R: Yes ok.</p>	P4 & R commence walk.
8.0	5-16	1.60	Red	2	<p>P4: And did you see I have a wee bathroom too. It's not very big but it's good and handy.</p> <p>R: Well it's lovely to have it so handy.</p> <p>P4: Yeah it's handy.</p> <p>R: Yeah it's great.</p> <p>P4: It's alright it's not beautiful but it's there and it's mine and nobody else is using it.</p>	P4 opens door of bathroom & shows it to R. There is a pause to chat about the bathroom.
10.6	30	0.10	Blue-green	3	<p>R: Yes. It's very good to have.</p> <p>P4: Oh yes.</p>	P4 commences walking again.
20.5	42	0.83	Yellow-orange	4	<p>P4: You see the floor dips down here...I know this off by heart.</p>	P4 comments on the ramps on the floor.

Table 3-2: Developed behavioural mapping table was as a result of trials.



Figure 3-1: Pixelated figure seen during F2_P2_W1.

To overcome ethical issues surrounding anonymity, images from the Vicon Revue cameras were Pixelated to render images of people indiscernible.

3.3.2 Piloting phase

As a follow up, the amendments were tested in the pilot study in a sheltered housing scheme with two older adults who did not have dementia. This gave the researcher experience of working with older people and was beneficial before conducting the fieldwork. The trial and pilot stages were essential to amend, improve and resolve any technological or methodological issues. It also highlighted where there may be ethical issues and the large amount of data which would need transcribed and analysed as a consequence of the observed walks.

3.3.3 Piloting interview questions

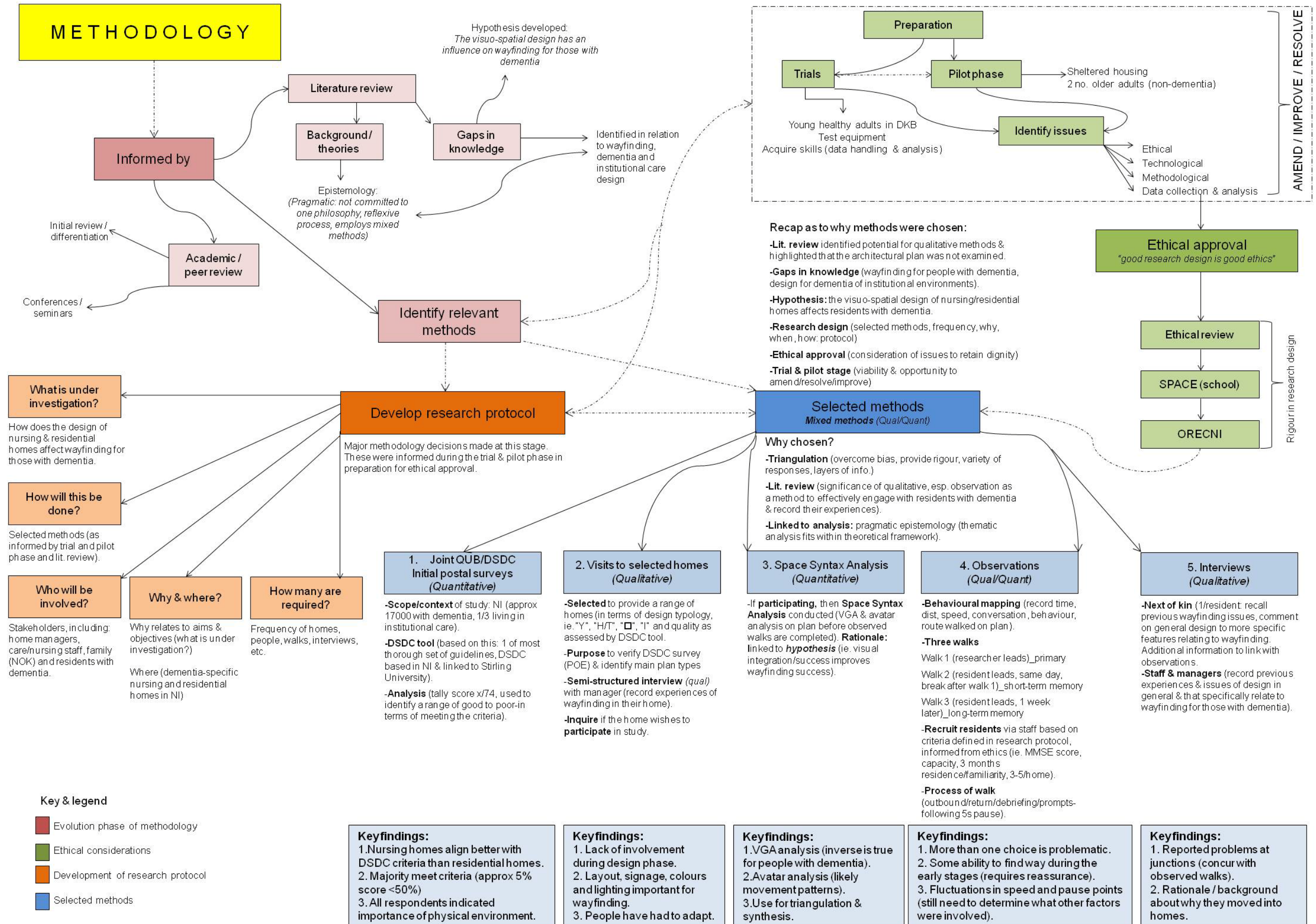
To ensure questions were understood and elicited an adequate response, pilot interviews were used to test the questions. In the case of briefing and debriefing, there were some alternative versions of the questions which could be used to ensure participants had the opportunity to respond to the questions being asked. Interview questions were developed and informed by the research question and research gaps which were determined from the literature review. Further information on this can be found in Section 3.6.1.

3.4 Research ethics

An important element of this thesis is the consideration of ethical issues, particularly as it directly involves people with dementia in the research who are considered to be a vulnerable group. As has been highlighted in Section 3.3, trialling and piloting played a role in determining how the methodology would impinge on ethical issues. This was an influential stage in developing the research design and writing a research protocol. The research design has therefore been an iterative process and was influenced by an extensive consideration of ethical issues which has also involved consultation with various bodies, including an Alzheimer's Society advocate. To develop an understanding of dementia and improve knowledge on design for dementia, suitable training was identified and attended. This included relevant courses held by DSDC and CARDI (The Centre for Ageing Research and Development in Ireland), both held in 2011.

Figure 3-2: Flowchart showing an overview of research methodology.

Methodology



The methodology roadmap (see Figure 3-2) shows that the preparation (pilot), ethical approval and developing research protocol phases were directly linked, sometimes causing a cyclical process as some issues required amendments to the research methods. This presents a summary of the decision process for the research design of the methodology. The research design allowed for successful engagement of participants with dementia in evidence-based research.

3.4.1 Ethical approval

Applications for ethical approval were made firstly to the school research ethics committee (within the School of Planning, Architecture and Civil Engineering (SPACE) at Queen's University, Belfast) and then (after obtaining sponsorship from University research governance), to the Office of Research Ethics Committee, Northern Ireland (ORECNI) an NHS committee. Ethical issues were considered at all stages and throughout the research design and in the development of semi-structured interview guides and material for the wayfinding walks (protocol, information and consent sheets). This stage was challenging and time-consuming. However the preparatory work involved in this has been of benefit to the research as many issues were dealt with before entering the field, allowing for data collection to run smoothly.

QUB School Ethical Approval

A research ethics proposal (see Appendix 1) was prepared and submitted to the School's Research Ethics Committee (SREC). This preliminary report highlighted the purpose and need for the research, aims and objectives, methods, resources and costs and the projected dissemination and outcome of the research. Related to the methods section, the stages of the study were discussed including informed consent, developing and defining inclusion criteria for the sampling and the recruitment of participants. Any risks to the participants and researcher were identified and considerations and actions were proposed to mitigate these. This considered issues relating to sampling homes, recruiting participants, obtaining informed consent, anonymity, confidentiality and any other risks relating to the fieldwork.

A person-centred approach was opted for to allow for the research to be tailored to the needs of the individuals. The aim of this was to maintain the rights and dignity of participants. Comments and considerations were responded to and ethical approval was granted by the School. The University's Research Governance was then consulted which initiated the process for the preparation of an application to ORECNI.

Police Disclosure and RQIA

Supervisors and various members of SREC advised that the researcher should obtain police disclosure (criminal record check) from AccessNI because the study involves regular contact with vulnerable adults. This application was made and granted. Copies were shown and given to any of the managers whose homes were involved in the research which was required for their records and as part of their assessment from the Regulation and Quality Improvement Authority (RQIA).

Obtaining Ethical Approval from ORECNI

A research protocol was written and developed as part of the application process to ORECNI. Research Governance advised on the various aspects of this process and offered guidance on improving information sheets, informed consent forms, the protocol and the Integrated Research Application System (IRAS) form. As previously mentioned the research protocol was informed by the literature review with trials and pilots used to refine this, in addition to highlighting and eliminating any methodological, ethical and technological issues (see Figure 3-2, p.64). This also identified any areas of potential concern including dealing with large quantities of data and protecting the anonymity of the participant and other building users by blurring their image which may appear in photographs obtained the Vicon Revue camera (see Figure 3-1, p.62). This process was onerous but assisted in refining the methodology and for the successful preparation for the subsequent ORECNI meeting. During this, questions from the panel were posed to the researcher and supporting documents, including options for blurring images were presented to illustrate these considerations. As part of the application to ORECNI the following were required:

- Signed IRAS (Research Ethics Committee) application form.
- Research protocol and project proposal.
- CVs from research and supervisors.
- Participant information sheets (home managers, staff, next of kin and residents participating in wayfinding task).
- Invitation letters to participants (home managers).
- Participant informed consent forms (home managers, staff, next of kin and residents participating in wayfinding task).
- Evidence of Sponsor's indemnity insurance.
- Letter from the Sponsor.
- Peer review: referees report and critique of the project.
- Interview guides.

Please see Appendix 1 for the research protocol and the IRAS form for further detail on the application for ethical approval to QUB and ORECNI.

A member of the ORECNI panel posited the idea that “good research design is good ethics and vice versa”. The research protocol gives further detail about what is under investigation, how it will be done, who will be involved, where it will be conducted, how many people or homes are required and the rationale behind these.

Other considerations included that whilst Northern Ireland had not yet approved the Mental Capacity (Health, Welfare and Finance) Bill, expected to be enacted in 2013/2014, England and Wales have passed a Mental Capacity Act in 2005 and Scotland passed a similar Adults With Incapacity Act in 2008 (Royal College of Psychiatrists, 2014). The Alzheimer’s Society advocate explained that although Northern Ireland has not approved the bill, the same principles should be considered when involving people with dementia in the research. The implication is that it is assumed that the person has the capacity unless it has been established that they lack the capacity (which is normally determined by a clinical psychiatrist). This premise was duly regarded during the preparation for ethical approval as it seemed to promote the value of dignity of those with dementia.

It was therefore determined that informed consent must come directly from the person with dementia participating in the walk and it was suggested by the Alzheimer’s Society advocate and School Research Ethics Committee that a more suitable means may be used to communicate details on the information sheet, for example, using larger text or pictograms where appropriate. It was important for the researcher not to cause offence or seem to be discriminating in doing this. The notion that those with dementia have the capacity to consent was raised as an issue during the ORECNI review meeting and although next of kin would receive information sheets regarding the research and invited for connected interviews, it was decided by the panel that it would be necessary to have the next of kin as a counter signatory on the participant’s (who has dementia) consent form.

This illustrates how views on ethics can be conflicting. While the stringent ethical procedures have been beneficial to the research design and methodologies for this thesis, it is understandable how it may discourage other researchers from involving people with dementia in their research.

The importance of involving people with dementia in the research relates to the fact that they are often overlooked and their carers or relatives are favoured. Their experiences and views are also important, however it is acknowledged that there may be disparities from the lived or actual experiences of the person with dementia.

Since it is established that people with dementia can be legitimate contributors and are capable of discussing ideas and providing insightful information, it was therefore necessary for this project to involve people with dementia to record first-hand experiences. It was thought that this would provide richer data which would then allow for a meaningful interpretation of the human-environment interaction and how design can help or hinder wayfinding.

The ORECNI panel were asked to consider the project for full ethical review and granted a favourable decision following the meeting. Research ethics involves examining all facets of the research, including research aims, the selection process (of homes and participants), recruitment, informed consent (which should be ongoing and revisited), data collection, methodologies, confidentiality/anonymity, risks to participants and the researcher. Detailed information on the ethical approval process, including information sheets and consent forms can be found in Appendix 1.

3.5 Sampling and recruitment procedures

Part of a rigorous research methodology is ensuring that suitable sampling procedures are employed. This thesis involved analysis of the design of nursing and residential homes, interviews with staff/carers and wayfinding based walk tasks with residents in these homes. In addition to the wayfinding walks conducted with selected residents in these homes, their next of kin were also invited to take part in the corresponding interview. This section discusses what sampling procedures were used throughout these processes.

3.5.1 Selection of fieldwork sites: nursing and residential homes

This study was based in the context of Northern Ireland where the scope is huge as there are many dementia specific care homes which provide around 5,000 spaces for an expected number of 19,000 people (diagnosed and undiagnosed). According to the Alzheimer's Society (2013) the rate of diagnosis (63%) is higher in Northern Ireland than in any other part of the UK. It is also expected that around 80% of those living in care homes have some form of dementia but have not been diagnosed (Alzheimer's Society, 2013c).

The role of the joint QUB and DSDC survey and the compiled list of homes

In preparation for differentiation and as part of the methodology used in the PhD study, exploratory work was conducted which guided and informed the research. This involved a joint Queen's University Belfast (QUB) and DSDC Northern Ireland postal questionnaire. This was conducted to assess the extent to which nursing and residential homes in Northern Ireland complied with dementia design criteria as defined by the DSDC audit checklist. The survey was structured into sections based on the DSDC checklist with questions regarding the location, type and capacity for care at the start, followed by 76 Yes/No/Not Applicable questions and finally two open-ended questions. These questions covered the following aspects of design: entrance, bedroom, bathroom, en-suite, dining room, treatment room, outdoor space design, activity areas, general principles and wayfinding.

The information regarding the list of homes with dementia specific care was obtained under the Freedom of Information Act (2000) and identified 75 nursing homes and 44 residential homes, giving a total of 119 dementia specific care homes. A compiled list of homes was created to conduct this survey which was intended to examine the extent to which these dementia specific homes complied with the DSDC "Dementia Design Checklist." The responses returned 53 out of a possible 119 completed by the home managers. The information from this was a starting point to gauge potential interest. However, homes which were of interest were not excluded on the basis of not responding to the survey.

It was found that the majority of home managers (95%) perceived their home to meet over half of the essential criteria with only five percent of homes falling below this rate. Nursing homes were identified as better at meeting the essential design criteria than residential homes (Hadjri et al, 2012). Since the postal survey was self-reporting by the home managers it was concluded that further investigation was required to evaluate the design of these long term care settings. This would allow to establish the deficiencies and strengths of the design and in particular promote ease of wayfinding.

The joint QUB and DSDC survey showed that there was room for improvement regarding the performance of the design of nursing and residential homes in Northern Ireland with regards to dementia (Hadjri et al, 2012). This prompted the need for further investigation and in-depth examination of the design of these buildings, including the impact of the essential design criteria on wayfinding success.

The author's involvement in this exploratory work was as a research assistant and it was used as a starting point for the PhD study, further details of this will now follow.

Considerations for the PhD Study

Although 119 long term care settings were identified during the exploratory postal survey, 15 of these homes were NHS trust run residential homes and consequently these were omitted from a list of potential homes to use in this research. This was due to the greater complications that would have resulted in the ethical application process to ORECNI (see Section 3.4) and the fact that these were controlled differently by a public trust body. In addition to this, it was felt that a sample of 104 was more than sufficient to select a smaller number of suitable fieldwork sites.

The survey also revealed attitudes of the home managers on the impact of design on people with dementia in their homes and an opportunity to express their opinion on any other relevant matters. Other information provided from the survey that was taken into consideration was the number of residents (an indicator of size).

Plan typologies and types of routes

Part of the process of selecting homes considered the layout of the home or typology which was recognised as a factor in determining different types of route. During the joint QUB/DSDC survey a range of plan shape types were identified. This included linear, circuit, Y/L/H/T shape plans. It was reported by some nursing and residential home staff that the circuit plan had been considered to be the best plan type for people with dementia because it allows for continuous walking (to support exploring or 'wandering'). After studying a range of homes, it was identified that in some cases, although the plan was influential in what types of route were available, it did not always mean that a route of the exact shape of the building would be used. For instance, in fieldwork Site 2 (which is a Y-shaped plan), many of the routes were linear with one or two decision points. It was important to highlight this at an early stage to provide a range of suitable homes that would be used as case studies within the time frame of the PhD study.

The identification of the main plan types was influential in selecting the case studies which would provide a range of route types. Google Maps was used as a means to examine what type of plan the homes were using the satellite view to determine the footprint of the building.

Then phone calls were made to the home managers to verify what type of plan their home was and where appropriate a visit to the home was requested.

Visits to selected homes

After studying the returned survey results and considering the relationship between plan typology and route types, 10 homes were visited to select a smaller sample for fieldwork case study sites. The visit to the home was agreed with the home manager and information sheets were also sent by email or post at least one week in advance. Any questions regarding the study could then be answered by the researcher. During the visits, the home managers were interviewed and they, or another member of staff, showed the researcher around. The researcher completed a blank survey form (Appendix 1) relating to the home to confirm to what extent the home met the DSDC design criteria.

Selected homes for the wayfinding tasks

If the home was suitable, the researcher explained the information sheets and the purpose of the research and asked whether the manager would be interested in their home participating. If informed consent was obtained from the home manager, a plan of the building was drawn up. A CAD-based analysis tool (Space Syntax) - Visibility Graph Analysis (VGA) and Agent Based Analysis - was used as another level of analysis (see Section 3.6.2). This was developed by Hillier and Hanson in 1984 at University College London (Ratti, 2004). It uses a form of architectural computing to analyse buildings or urban areas by treating them on a “space first” basis to provide an understanding of the social meaning of space (Stonor, 2008). Routes were determined when residents were recruited. A total of four homes were selected following this process, as case study sites, where wayfinding walks and associated interviews with next of kin would be conducted (see Table 3-3). This included a Y-shape plan (F2), H-shape plan (F3), linear type plan (F4) and a circuit or figure of eight type plan (F5). The four selected case studies were intended to provide a variety of route types which are commonly experienced in the context of long term care settings. For instance, the Y and H shape type plans were intended to cover route types that would arise from L and T shape type plans.

The following pages provide further detail about the design of the four selected fieldwork sites. This is presented in an A3 matrix in Table 3-4 and shows the design layout and trends, VGA and Agent Based Analysis. VGA is used to assess how visually accessible areas of the architectural plan are which in turn influences wayfinding and legibility.

Agent Based Analysis is used to simulate human behaviour and movement using avatars to mimic this. Together it is contended that VGA and Agent Based Analysis can predict how architectural layouts and configurations influence movement and wayfinding (Penn, 2003; Stonor and Stutz, 2004).





Fieldwork site	Type of care	Number of residents	Plan typology
Two (F2) 	Residential	40 (All dementia care: 24 first floor, 16 ground floor, 8 of which in secure unit on ground floor).	Y-shape plan.
Three (F3) 	Nursing	33 ground (Additional 33 first floor general nursing)	H-shape plan.
Four (F4) 	Nursing	24 ground floor (Additional 52 ground floor general nursing)	Linear plan with circuit off main area.
Five (F5) 	Residential	32 (all ground floor)	Circuit type: figure of eight with central circular area.

Table 3-3: Details of the selected fieldwork sites.

3.5.2 Recruitment and informed consent for those participating in the wayfinding tasks.

Recruitment through staff appointment

Home managers were the gate-keepers to allowing the remainder of the research to take place. Members of staff were identified as having a role in helping to identify potential participants for the wayfinding tasks. The staff were on permanent contracts and had served in the selected home for a minimum of three years, so they had expertise as they were familiar with the setting and the residents. A list of inclusion criteria was devised to assist staff in identifying suitable candidates to approach to participate in the wayfinding task.

Staff would then approach residents and their next of kin to inform them about the study, supplying the information sheets provided. The researcher would not make direct contact with the residents or their next of kin unless they had opted to participate in the study (they were given at least one week to respond to the invitation to participate in the research).

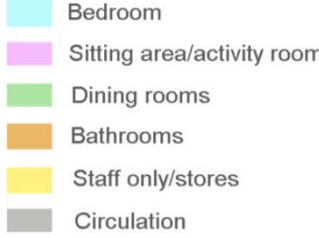

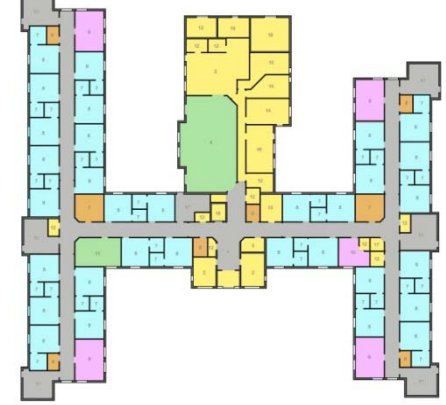
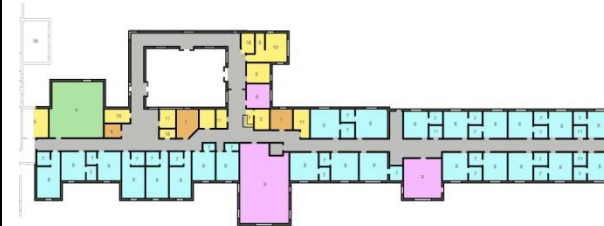
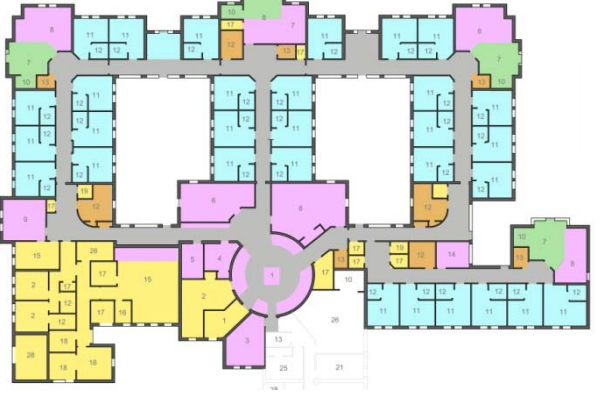
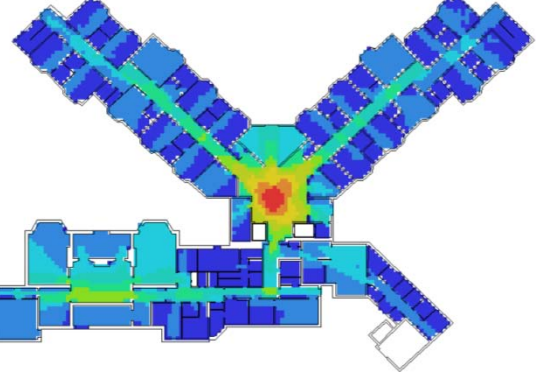





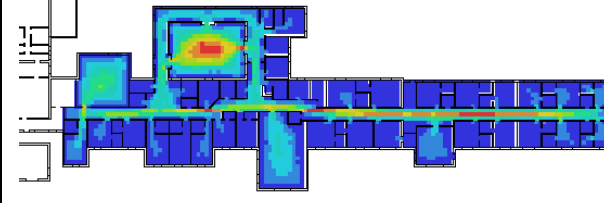

This was important in terms of ethics as it could be construed as coercion (they should not feel under pressure to participate) if the researcher was to approach residents without giving them time to consider participation on their own.

Principle inclusion criteria

As part of the process for selecting eligible participants for the wayfinding task it was necessary to outline criteria for selection. It was established that participants were likely to be older adults who were living in long term dementia care facilities (nursing or residential care homes). For the purpose of the wayfinding task participants needed to be mobile and would be known to have a mild cognitive impairment or memory problems. Suitable residents should have resided in these homes for at least three months to ensure that they are familiar with their surroundings. Staff were asked to consider the following:

- The residents shall have lived in the home for a minimum of three months.
- The potential participant shall have the capacity to understand the wayfinding task and give informed consent.
- Suitable residents shall have the physical ability to go on a short walk (they may or may not use walking aids).
- Age and gender: there is no preference, however, it is likely to include older adults.
- It is likely that a MMSE (mini mental state examination) has been completed by a qualified medical professional to determine what stage of dementia an individual has. These results should be taken into account and made available to the researcher as part of recording participant demographics and allowing the research to be transferrable and comparable. Those with mild-moderate stages of dementia may be more suitable to participate in the task.

Table 3-4: Matrix showing design details, and Space Syntax analysis (VGA, and avatar-based analysis) of selected fieldwork sites.

	Fieldwork site two (F2)	Fieldwork site three (F3)	Fieldwork site four (F4)	Fieldwork site five (F5)
Design layout and trends Key & legend 	 <p>Y-shape plan with central area. "V" part of wings are symmetrical. Sitting areas dispersed throughout. Dining room was relocated to one centrally located larger space for monitoring.</p>	 <p>H-shape plan with two separated units and several lines of symmetry. Main entrance is directly off circulation area.</p>	 <p>Limited number of shared social areas, reducing variety. Long linear plan type. Circuit attached to linear plan, however no incentive to go here due to lack of accommodation (race-track only).</p>	 <p>Compact figure of eight plan with central circular area. Strategically organised space with staff only areas zoned to an area and many shared social areas dispersed within the plan.</p>
VGA	 <p>Visibility is strongest in the central seated area and dissipates towards the end of the corridor wings.</p>	 <p>Visibility is strongest in the central foyer area and at the T-junctions.</p>	 <p>The area immediately outside the nurses' station and main lounge is shallow. The circuit path is quite deep in terms of visibility indicating a less connected area.</p>	 <p>There is a strong visual connection at the central area junction to the bedroom and shop corridors. The pattern is similar at the bedroom to garden corridor T-junction and slightly weaker but still significant on corners of the figure of eight.</p>
Agent Based Analysis	 <p>Main patterns of movement are along corridors and are particularly strong on the "V" part of the wings.</p>	 <p>Main patterns of movement are along corridors with some concentrated areas along straight parts of corridors.</p>	 <p>Main patterns of movement are along corridors, especially the straight part of the corridor.</p>	 <p>Main patterns of movement appear to be evenly distributed throughout the corridors with some areas of concentration at corners and T-junctions.</p>

A caveat was also placed on the MMSE as it has been subjected to some criticism in recent years. The Alzheimer's Society advocate suggested that it would be preferable to allow staff to take their knowledge of that individual and use their own judgement based on their experiences with them on whether they would be suitable to participate in the wayfinding task. Folstein and Folstein (1975) and Friedl et al (1996) explain that the short 30 point MMSE is not definitive and is usually conducted once, at a certain time of day on a set date. However, due to the nature of the disease, it is recognised that cognitive ability can fluctuate. This reinforced the importance of involving staff in the selection of potential participants in the wayfinding tasks.

Exclusion criteria included those who were unable to give informed consent for themselves or those who did not have the capacity to understand the task, those who were not mobile or those with mobility problems that would impair them from the wayfinding task.

Recruited participants





Fieldwork site	Number of participants recruited	
Two (F2) 	4	Participant one (F2_P1) Participant two (F2_P2) Participant three (F2_P3) Participant four (F2_P4)
Three (F3) 	4	Participant one (F3_P1) Participant two (F3_P2) Participant three (F3_P3) Participant four (F3_P4)
Four (F4) 	1	Participant one (F4_P1)
Five (F5) 	5	Participant one (F5_P1) Participant two (F5_P2) Participant three (F5_P3) Participant four (F5_P4) Participant five (F5_P5)

Table 3-5: *Number of fieldwork participants recruited for the observed wayfinding walks in the four fieldwork case study sites.*

Table 3-5 shows those who were recruited as a result of the inclusion criteria. Issues occurred in fieldwork site four (F4) where only one participant could be recruited due to the nature of the clientele residing in the nursing home. Most of the residents were either immobile or unable to communicate/understand the task thus limiting the number of participants. Ideally this would have been a larger number but wayfinding problems experienced by F4_P1 reflected findings in other homes where corners and T-junctions caused difficulty. In other homes the same issues were experienced by many of the participants. Demographics were collected from each of the participants to allow results to be transferrable and also to take specific information into consideration (see Table 3-6).

3.5.2 Recruitment of next of kin for interview

Linked to those who participated in the wayfinding walks

Semi-structured interviews were used with carers and next of kin to provide an opportunity for them to share their knowledge and experiences. These interviewees were linked only to the residents with dementia who participated in the wayfinding walks. This was to explore their attitudes and experiences of design for dementia. This would provide another layer of data and afford the researcher with the opportunity to ask any relevant questions linked to the wayfinding walks.

Table 3-6: Participant profile data, and demographics for participants from F2, F3, F4, and F5

Methodology

	F2_P1	F2_P2	F2_P3	F2_P4
Age	85	87	89	99
Gender	F	F	F	F
Length of residency	3 years 10 months	6 months	6 months	2 years 11 months
Dementia	Yes	Yes	Yes	Yes
First diagnosed	1 year 2 months	8 months	5 years (2007)	4 years (2008)
Type	Age related dementia	Age related dementia	Alzheimer's	Age-related dementia
Stage (MMSE)	Mild (MMSE score 20-25)	Mild to moderate (MMSE score 18-22)	Moderate to severe (MMSE score 7-12)	Moderate to severe (MMSE score 7-12)
Other	Visual (cataracts and high pressure in the eyes: receives injections every 3 months) CKD (Chronic Kidney Disease) stage 4. Uses tri-rollator walking aid	Reduced vision (wears glasses: age deterioration/duty age) Uses tri-rollator walking aid	Reduced vision due to macular degeneration. Diabetic Uses tri-rollator walking aid	Charles Bonnet Syndrome Angina Peripheral vision only in left eye.
Action capability (10m walk test)	0.32m/s	0.70m/s	0.21m/s	0.59m/s

	F3_P1	F3_P2	F3_P3	F3_P4
Age	79	89	82	73
Gender	M	F	F	M
Length of residency	10 months	3 years	10 months	1 year 3 months
Dementia	Yes	Yes	Yes	Yes
First diagnosed	5 years (2007)	8 years (2004)	2 years (2010)	5 years (2007)
Type	Vascular	Vascular	Alzheimer's	Korsakoff's syndrome (alcohol related)
Stage (MMSE)	Moderate (14)	Late (very repetitive: 6)	Moderate (high quality of life: 15)	Moderate-late (7)
Other	Sundowning Uses walking stick (sore legs) Hypotension UTIs COPD Prostate lobes (2011) Multi pulmonary embolisms (PEs-on warfarin)	Walked unaided (walk 1), walked using stick (walks 2 & 3) History of falls Fibromyalgia Osteoarthritis Vertigo (low blood pressure-dizzy heads) Diverticulitis Depression (past history) Renal failure UTIs	Walked unaided for all walks. COPD Dry eyes Bowel cancer (10 years ago) Hiatus hernia Hysterectomy & bladder repair	Walked unaided on all walks Becomes fixated about things (tea, walks, smoke-presents with verbal abuse) History of alcohol abuse (last drink was day before admitted). Fractured patella (January 2012) Linked with mental illnesses (no psychosis)
Action capability (10m walk test)	0.42m/s	0.38m/s	0.56m/s	0.65m/s

	F4_P1
Age	84
Gender	F
Length of residency	2years 5months
Dementia	Yes
First diagnosed	10 years (2002)
Type	Vascular / Alzheimer's
Stage (MMSE)	Moderate-late (early stages of late: 6)
Other	Walked unaided (hooked onto researcher or holds onto handrail) Hypertension Hysterectomy Thyroidectomy Type II diabetes
Action capability (10m walk test)	0.30m/s

	F5_P1	F5_P2	F5_P3	F5_P4	F5_P5
Age	74	71	89	80	83
Gender	F	F	F	F	M
Length of residency	1 year 1 month	7 months	1year 7 months	1 year 9 months	2years 3months
Dementia	Yes	Yes	Yes	Yes	Yes
First diagnosed	3 years (2009)	3years (2009)	3 years (2009)	2 years (2010)	5 years (2007)
Dementia related illness	Vascular dementia		Alzheimer's	Vascular	Alzheimer's
Dementia related illness	Moderate-late (MMSE 13)		Mild-moderate (MMSE 19)	Mild-moderate (MMSE 20)	Moderate (MMSE 14)

3.6 Selected methods

Following a favourable decision which was granted for the ethical approval submitted to ORECNI, fieldwork commenced. This section of the chapter seeks to present the empirical methods used in the fieldwork and provide information on why they were chosen and how they were implemented in the research. As previously discussed, a mixed methods approach was used to provide a triangulation, using interviews with next of kin and staff and conducting wayfinding walks with residents. The wayfinding walks were an ethnographic method selected to observe how the design of the physical environment affected wayfinding by examining conversation, behaviour and speed as they walked around their nursing or residential home. These walks were designed to involve people with dementia in the research, to elicit their responses and record their personal experiences. In addition to this, connected briefing and debriefing sessions were used to provide a more conversational approach to a semi-structured interview. Table 3-7 indicates an overview of the fieldwork which took place.





	F2 	F3 	F4 	F5 	Other	Total
Interviews with staff/carers	1	3	1	1	2	8
Interviews with next of kin	2	3	1	5	-	11
Participants in wayfinding walks	4	4	1	5	-	14
Wayfinding walks (repeated measures design)	4x3= 12	4x3= 12	1x3= 3	(3x3) + (1x2) + (1x1) = 12	-	39

Table 3-7: Summary of numbers of fieldwork participants in the interviews and observed wayfinding walks.

3.6.1 Semi-structured interviews

Semi-structured in-depth interviews were selected as an appropriate method over structured or unstructured interviews as they follow an interview guide with predetermined questions but allow for a degree of flexibility and are suitable for collecting in-depth data. Flexibility in interviews and the ability to probe further questioning was viewed as an advantage by Kvale (2010) who argued that semi-structured interviews provide engagement through active listening and can elicit a richer response and further elaboration. Semi-structured interviews were used to explore attitudes, record anecdotes and provide an opportunity for the people who are considered “experts” in the area to report their experiences (Sommer and Sommer, 2002; Bernard, 2006). The following were highlighted within the research protocol as suitable probes or responses for the researcher to use when conducting a semi-structured interview:

- Silence (sometimes accompanied by a nod).
- Echoing (where the participants response is repeated back to them).
- The use of “uh huh” (which is considered to be affirmative but neutral, so can extend the conversation).
- “Tell me more” (which specifically articulates that the researcher would like the participant to elaborate on their response). Who, where, what, why, when and how?

In the case of this thesis, paid staff (including managers and carers) and the resident’s next of kin (associated with residents who participated in the wayfinding walks) were interviewed. The reason for interviewing both groups was that carers would be familiar with the wayfinding walk participants in the long term care setting, allowing them to report specific issues relating to the design of the home and the next of kin would be able to comment on previous issues and their experience of the home they are now residing in. The ultimate aim of the interviews was to compare them with the actual observed wayfinding tasks and provide additional information which may support obtained data.

Another form of interview would involve the residents who participated in the wayfinding walks. This would follow a similar semi-structured interview guide, however the style would be more conversational and form part of a briefing and/or debriefing session to the wayfinding walks.

Development, piloting and review of interview questions

Kvale (2010) advocates the importance of not imposing a position on the interviewee so leading questions should be avoided. Part of the preparation of the interview guides involved a piloting and reviewing process by others, including preparation for ORECNI and review by the ethics committee panel (see Sections 3.3.3 and 3.4). This led to re-wording or re-writing some of the questions to clarify the meaning and effectively address the topics under investigation.

The origin of the questions were linked with the research aim and objectives and was influenced by the responses to the existing DSDC dementia design guidelines checklist, a joint survey conducted by QUB and DSDC. Further details about the content of these questions will now be explained.

Specific details of staff/carer interviews

The rationale for interviewing staff was because they are immersed in the environment, so it was envisaged their experience and familiarity to the homes and residents could reveal and establish knowledge on the following issues (for further detail see Appendix 1: interview guide for staff):

- What type of issues affect residents with dementia?
- How the home has taken steps to improve the design?
- Which design issues affect the delivery of care to residents with dementia and how it may be improved to support this (with consideration to the various stages the home caters for)?
- How social activities are influenced by the design of the home?
- The potential effect of the physical environment on people with dementia?

Sommer and Sommer (2002) recommend that the interviewer begins with general questions and move onto the more specific questions. They suggest general questions assist in determining the knowledge a person has on the topic and help to build rapport between the researcher and interviewee. Kvale (2010) suggests that briefing and debriefing are also important in building the relationship between the interviewer and participant.

This was a technique employed in the structure of the interview, where the above questions are more general to promote dialogue and the latter section of the interview is more specific, with questions on wayfinding. These were designed to complement information obtained from the wayfinding walks with the residents with dementia. It was also an opportunity for the researcher to determine any design issues which may not have presented during the walks. Below are details of the content of the remaining wayfinding specific questions:

- How does the layout of the building and which features of the interior design promotes or hinders wayfinding?

The duration of these interviews lasted around one hour and this was conducted once per person. Seven home managers were interviewed, alongside some additional care staff in each of these homes. The home manager acts as the gate-keeper so this phase is important to determine suitability of the home for participation in the wayfinding walks. Consequently, four homes were selected to be used as case studies and provide a range of layouts and design typologies which would create different routes for the wayfinding walks. Prior to the interview (at least one week in advance), the manager was given an information sheet detailing the research which provided an opportunity to discuss this and set up dates when the fieldwork may be conducted. Saturation was reached in interviews as themes became exhausted and repetitive in each of the homes.

Specific details of interviews with the residents' next of kin

Next of kin aligned with residents who had part-taken in the wayfinding walks were invited to take part in an interview. The intention of this interview was to reveal additional and complementary information to the conducted wayfinding walks. This gave next of kin the opportunity to share their experiences with the researcher. The interviews also offered the researcher the opportunity to enquire about particular observations they witnessed during the wayfinding walks. These interviews were conducted after the walks had been completed to avoid introducing bias as the next of kin would be likely to disclose positive and negative issues the resident encounters within the environment. Fourteen participants for the wayfinding walks were recruited so each of these participant's next of kin were invited to take part in an interview, 11 of the participant's next of kin accepted and completed the interview. In three cases (F2_P3, F5_P1 and F5_P4) an additional next of kin joined, giving another response in these interviews (a total of 14 people were present at the 11 interviews).

The content of the questions were similar to those asked to staff and again moved from general opening questions to more specific questions regarding wayfinding. Interviews lasted around one hour. The issues the questions covered were (for further detail see Appendix 1: interview guide for resident's next of kin):

- What type of issues affect residents with dementia?
- Which design improvements could promote the wellbeing of their next of kin?
- How social activities are influenced by the design of the home?
- What is the effect of the physical environment on their next of kin?
- How does the layout of the building and features of the interior design promote or hinder wayfinding?

Wayfinding walks: briefing and debriefing

Another form of semi-structured interview was used to record verbal responses from residents with dementia who participated in the wayfinding walks. The specifics of the wayfinding walks are detailed in the next section. Conversations during the walks were also recorded and transcribed as this can be used to interpret immediate effects of the environment where the participant may verbalise their thoughts. The debriefing was intended to be a more conversational approach to interviewing those who participated within the wayfinding walks as recommended by Marshall (1996). Despite the element of structure to these interviews, there was an opportunity to allow for deviation from the topic and remain as naturalistic as possible to avoid causing distress.

The questions used related to what experience the resident with dementia had during the walk, what features assisted in helping them to find their way and what improvements could be made to further assist wayfinding. The work of other researchers including Lynne Mitchell and Gesine Marquardt were studied as part of the literature review and were influential and helpful in the design of the wayfinding walks.

Debriefing took place immediately after each of the walks where each of the 14 participants were given a seat (usually in the destination if possible). These sessions lasted between five to 30 minutes. With regards to the longer sessions, this was consequential of how distracted, talkative or verbose the participant was.

The rationale to keeping the questions as part of a conversation was to elicit responses while avoiding unnecessary distress that may be experienced in a more formal interview process. Many researchers including Sommer and Sommer (2002), Bernard (2006) and Flick (2008) report the positives of carrying out interviews in naturalistic settings and formats. Denzin and Lincoln (2003) explain that it can potentially allow the researcher to make sense of the phenomenon under study by placing it in the context of the meaning that people bring to them. The wayfinding walks and the debriefing sessions were designed to gain insight from residents with dementia. This would contribute to the research by providing a platform to record actual experiences, values and opinions.

3.6.2 Wayfinding walks

Design and description of wayfinding walks

When a home was selected and suitable residents were being identified by staff based on the selection criteria, preparation and planning of the walks commenced. This involved various stages before walks could take place. The first step was to obtain the plan of the building. Dimensions were checked on site and this was then drawn up on a computer using AutoCAD. It was then necessary to consider which area would be walked.

The role of Space Syntax

Space Syntax was used to examine the integration of spaces before walks were conducted. This was useful in planning routes to be used. Space Syntax is a quantitative CAD-based methodology developed by Hillier and Hanson in University College London in 1984 (Ratti, 2004). The technology can be used as a design tool for making planning and design decisions, by examining space on an urban level or within structures. Bafna (2003) and Stonor and Stutz (2004) recognise that Space Syntax can be used to investigate the relationship between humans and their environments, making it a valid method for spatial analysis which can provide an understanding of the sociology of space in relation to its configuration.

The plan is used to decipher visibility between spaces and considers access and boundaries which might affect movement. Space can be described in terms of intelligibility, where a more intelligible space allows for integration as it is legible due to the small number of decision or pause points from an origin to a destination.

Penn (2003) suggests that this can make wayfinding simpler as opposed to unintelligible space which has more randomly occurring pause points, usually due to the predominance of junctions or decision points. Spatial accessibility is also examined which is linked to wayfinding as it relates to continuity, connectivity and the recognition of the effects of spatial patterns (Batty, 2004). The role of Space Syntax in this thesis will involve the use of Visual Graph Analysis (VGA) and avatar or Agent Based Analysis. VGA produces a spectral graph which is overlaid on the plan and is based on how spaces are linked visually which can determine how accessible or permeable an area is. Hillier and Hanson (2003) explain that areas may be described as shallow or integrated which will appear as a warm red-orange hue or deep or segregated which will be indicated by a cool blue-green hue on a VGA graph. The relevance of this to wayfinding is that shallow (red-orange) areas may be considered successful as they are easy to reach, whereas deep (blue-green) areas are less successful as they are harder to reach. Linked to VGA is Agent Based Analysis which can be used to predict patterns of movement in space. The agents which are released in a simulated model follow these assumptions:

- Movement is purposive.
- Users have perfect knowledge of the environment they are traversing.
- They follow human behavioural patterns (eg. crowd behaviour and pausing to look at something or talk to someone).

Space Syntax using VGA and Agent Based Analysis were therefore identified as suitable methods of analyses of architectural plans.

Planning the route

Route planning needed to provide a range of decision points and cover different areas of the building in each of the four typologies. Each of the participant's routes needed to be planned individually as they may be more familiar or like to spend their time in specific areas of the building. Information from next of kin and staff was taken into account at this stage. The plan and environment was examined and the researcher checked with staff and next of kin whether the resident would be familiar with the route, start/end points and terms the participants would know them as so they could be referred to in that manner using that specific wording, eg. Parlour versus activity room. Before the walks, the researcher checked that the route was not unduly obstructed to avoid any inconvenience.

Space Syntax analysis was used at this point by running VGA and avatar analysis to establish how the layout and plan of the building might affect visibility and movement. This could later be compared to the reality of the observed wayfinding walks. Patterns could then be identified regarding layout typology and the effect on wayfinding for people who have dementia. Findings may then determine the efficacy of Space Syntax in its role for predicting social behaviour in terms of wayfinding for dementia and indicate any computational shortcomings.

Action capability test

Participants were selected to take part in the wayfinding tasks based on the defined criteria (see Section 3.5.2). When informed consent had been given by the participant and their next of kin, they were then required to do an initial action capability test. This was designed to record an average walking speed and consisted of a 10 metre, straight line walk which allowed the researcher to record the time taken for them to walk it. This was repeated three times and an average was taken. The purpose of this was to establish each individual's cadence and enables data to be normalised based on their personal performance. Normalising speed data sets then facilitates comparison between individuals within the same home so patterns may be identified where a person may hesitate or slow down which could indicate a problem experienced with wayfinding. This information is available on the demographic sheet (Table 6) and was also displayed on the A3 analysis sheets (Figure 3-4).

Repeated measures design

A repeated measures design was adopted to study changes in the participant's wayfinding ability over time. This involved repeating walks for each participant, which would ideally result in three walks per participant. The conditions of each of the walks remained the same, with the only variable being that the first walk was led by the researcher and the final two walks were led by the participant. As mentioned, the first walk was where the researcher led the way to demonstrate the route and the locations of the start and end points. The initial walk was the control and is intended to provide an opportunity to learn. The second walk was repeated on the same day as walk one, approximately 20-30 minutes later to allow for a rest in between walks. During W2, the researcher instructed the participant to lead the way and is intended to be an indicator of short term memory. Walk three is again led by the participant but is performed one week later as a gauge of long term memory retention.

During the second and third walk the researcher walks behind the participant to ensure the resident is leading the way. Return parts of the journey are also recorded to act as a control and determine patterns of issues and positive aspects of the environment that assist wayfinding.

Measures of the walks

The pilot stage assisted in determining how best to conduct the wayfinding walks (see Section 3.3). This was allowed to refine what equipment would be used to efficiently record the observed walks. Equipment used was decided based on the logistics of carrying out the fieldwork and also based on the resources or funding available. The Vicon Revue cameras were purchased using an awarded research grant. Accelerometers were considered, although these were not available as they were in use at the same time by the University's School of Medicine. Global Positioning Systems (GPS) were considered when selecting equipment for the walks. It was advised by the manufacturers of some of this equipment that it would only be accurate within three metres which would be too great a fluctuation to accurately map the walks. It was therefore decided that GPS was not appropriate for the internal environment as it may not work at all or as effectively as needed. Table 8 shows what equipment was selected and what it was used to record.

List of equipment used during the wayfinding walks	Purpose (recording)
Clipboard with building plan, set of debriefing questions and blank paper.	Route, behaviour, verbal responses. Numerical point on plan corresponded with conversation or behaviour.
Vicon Revue lanyard cameras (one for researcher and/or one for participant).	Egocentric views of physical environment (what is seen).
Mobile phone (with video camera recording)	Video: images of physical environment, conversation, responses, location (distance and route), time and behaviour.

Table 3-8: A finalised list of equipment used during the wayfinding walks and what each item was used to record.

A supplementary A3 formatted sheet was developed to complement the developed behavioural mapping sheet (see Figure 3-4). During the analysis and synthesis phase, these two documents were combined on a large Microsoft Excel matrix which enabled cross checking to find patterns and areas which promoted wayfinding or caused problems.

3.7 Triangulation of methods

Leedy and Omrod (2004) explain that triangulation can be used as a strategy to ensure validity. This research does this by using mixed methods which provide multiple converging sources of data from which common themes have emerged. Groat and Wang (2002) acknowledge that this can overcome the strengths and weaknesses of any single method and that by using multiple methods simultaneously, they provide benefits to the research through complementing one another. The use of different methods provides multiple perspectives, enabling the researcher to clarify meaning, verify repeatability and avoid misinterpretation (Denzin and Lincoln, 2003).

The challenge of triangulation lies in combining the various methods, particularly during data collection and analysis phases of the research. Leedy and Omrod (2004) suggest that preliminary analysis should occur during the data collection process to identify any areas of convergence where separate data from the various methods share similar patterns and point to the same conclusions. This PhD involved the use of five methods (Figure 3-2, p.64), which included the following:

- Joint QUB/DSDC postal survey which acted as an exploratory study.
- This was followed by visits to the homes to identify case studies with appropriate design typologies.
- Space Syntax analysis (using VGA and avatar based analysis).
- Observations of wayfinding tasks in the selected homes with selected participants. This also involved briefing and debriefing with the participants in a semi-structured conversational style interview.
- Semi-structured in-depth interviews with home managers, staff and next of kin.

The findings which resulted from these methods were eventually combined to produce recommendations relating to design of long term care settings for people with dementia.



Figure 3-3: The early stage of analysis and the process of synthesising findings.

The initial process of analysis involved rough work to quickly identify patterns and common themes which would be investigated further using Excel sheets (Appendix 3).

The process of data analysis involved the cross examination of the results which emerged from the various methods used. This was examined simultaneously to highlight patterns and convergence. Figure 3-3 illustrates how early rough work was used to compare data from the wayfinding tasks and the conversation, behaviour and speeds recorded as part of the behavioural map.

Due to the mixed methods approach there was a large amount of different types of data which was initially difficult to handle. These layers of information were consequently collated onto A3 sheets to enable easier cross referencing (Figure 3-4, p.90). Microsoft Excel was then used to produce large scale matrices which would hold all the data relating to each walk, including the information from the behavioural map and Space Syntax which produced 39 sheets (Appendix 3). This facilitated identification of problem areas whereby the participants' speeds were reduced or caused them to become stationary and examined other alerts which may have increased their speed.

In addition to this other triggers such as behaviour and conversation were studied as potential wayfinding cues or distractions could be identified.

Dealing with different layers of data proved to be challenging and time-consuming. However the use of mixed methods to provide a triangulation resulted in convergence of results and common themes.

3.8 Summary

The development of the research design was informed by gaps found within the literature review, the pilot phase which helped to identify technological, methodological and data collection and analysis issues. This was also significantly influenced through the extensive consideration of ethical issues and seeking ethical approval within the university and to the NHS body ORECNI. The literature review identified the benefits of involving people with dementia in the research to record their lived experiences. This chapter highlighted the challenges regarding recruiting suitable participants and ongoing informed consent. Smaller sample sizes resulted due to the time-consuming process, however these were rigorous in-depth case studies which were regulated through a repeated measures design. Recognition of the potential for qualitative design led to a mixed methods design which followed the work tested by other researchers and used triangulation to complement and layer onto the quantitative data.

The next chapter explains the process used during the interview analysis and presents the findings which emerged from the responses from staff and next of kin.

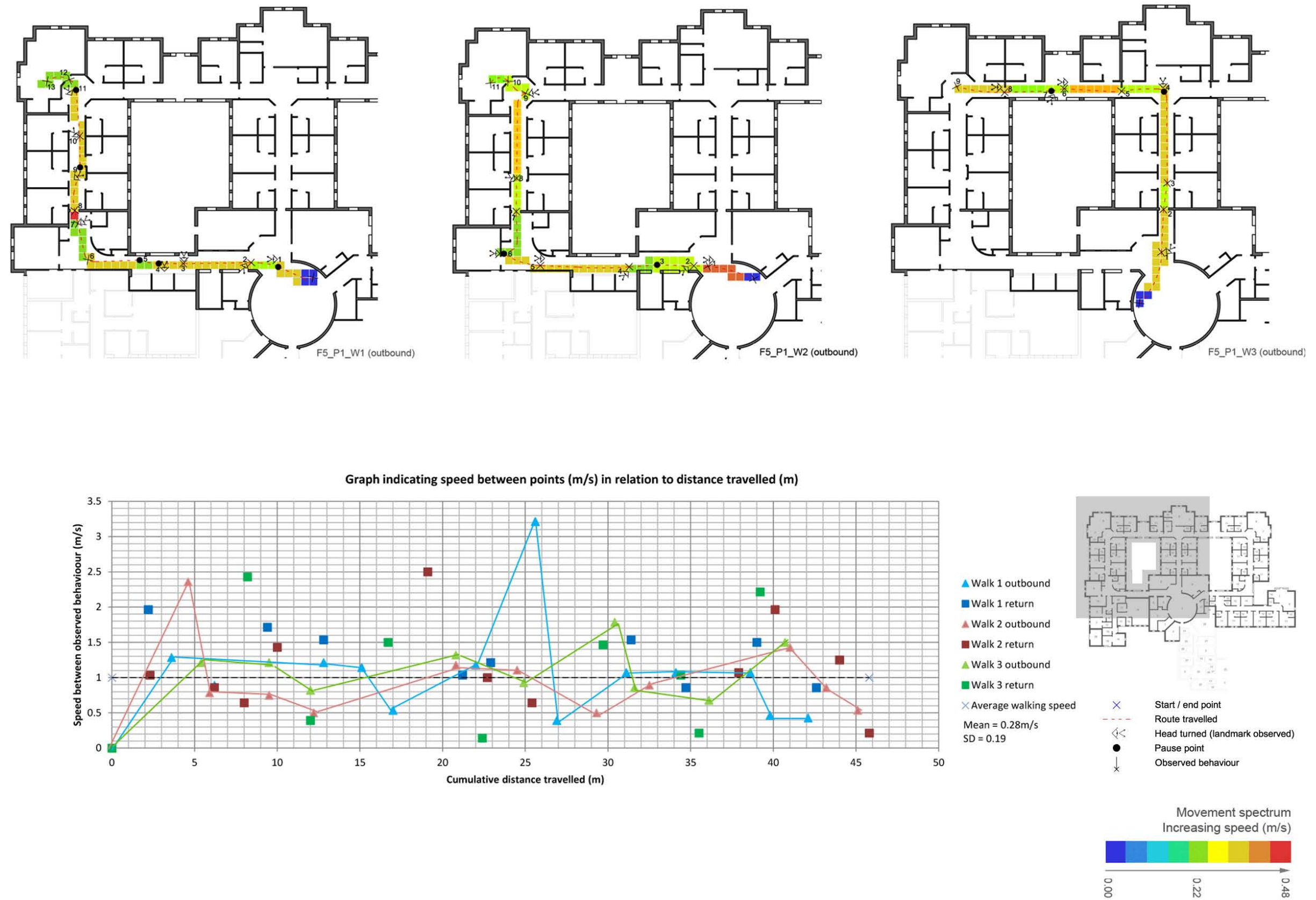


Figure 3-4: Complementary A3 formatted sheet developed to be read with behavioural mapping sheets.

This sample is from F5_P1, and details the route, behaviour, and fluctuation in speed in relation to the “normal” or average speed for F5_P1 on the outbound journey of walks one, two, and three.

Chapter 4: Interviews with Staff and Next of Kin

4.1 Introduction

This chapter describes the methods used for conducting interviews and provides an overview of the results from the responses and finally discusses their implications. The structure of this chapter firstly reports results from the care staff that have day-to-day experience with the residents in the nursing or residential homes. In addition to this, next of kin linked with the residents who participated in the wayfinding tasks were invited for interview. This was to provide their perspective which was considered to be important as they would have knowledge before and after the resident moved in. As part of the wayfinding walks, conversational style semi-structured interviews were used to provide an opportunity for the people with dementia to give their own viewpoint. Details of the resident's responses to these debriefing sessions are within Chapter 5, Sections 5.3.1, 5.3.2, 5.3.3 and 5.3.4.

4.2 Methods

In-depth semi-structured interviews were completed with staff and next of kin associated with the participants of the wayfinding task. Details of this can be found in Chapter 4 (see Sections 3.3.3, 3.5.2 and 3.6.1).

Analysing the interviews

Thematic analysis was used to interpret, identify themes and capture an understanding of the phenomenon under study. Fereday and Muir-Cochrane (2006) state that interview analysis should be a hybrid process involving inductive (bottom up and data driven) and deductive (top down and theory driven) analysis. Braun and Clarke (2006) concur and explain that the process is iterative, reflexive and recursive.

The process of coding commenced at an early stage when the interviews were conducted and these were developed during transcribing to initial manual analysis. The research question *“How does the design of the physical environment affect those with dementia”* was referred to throughout this to ensure relevance. The procedures for thematic analysis are outlined by Attride-Stirling (2001), Braun and Clarke (2006), Fereday and Muir-Cochrane (2006) and Saldaña (2009). A code manual was developed and codes were assigned manually. NVivo was then used as a tool for coding and organising themes. These codes were then connected and classified in a hierarchical manner from basic to organising to global themes. These were then reviewed and refined to ensure representation (Figure 4-1).

Interviews with Staff and Next of Kin

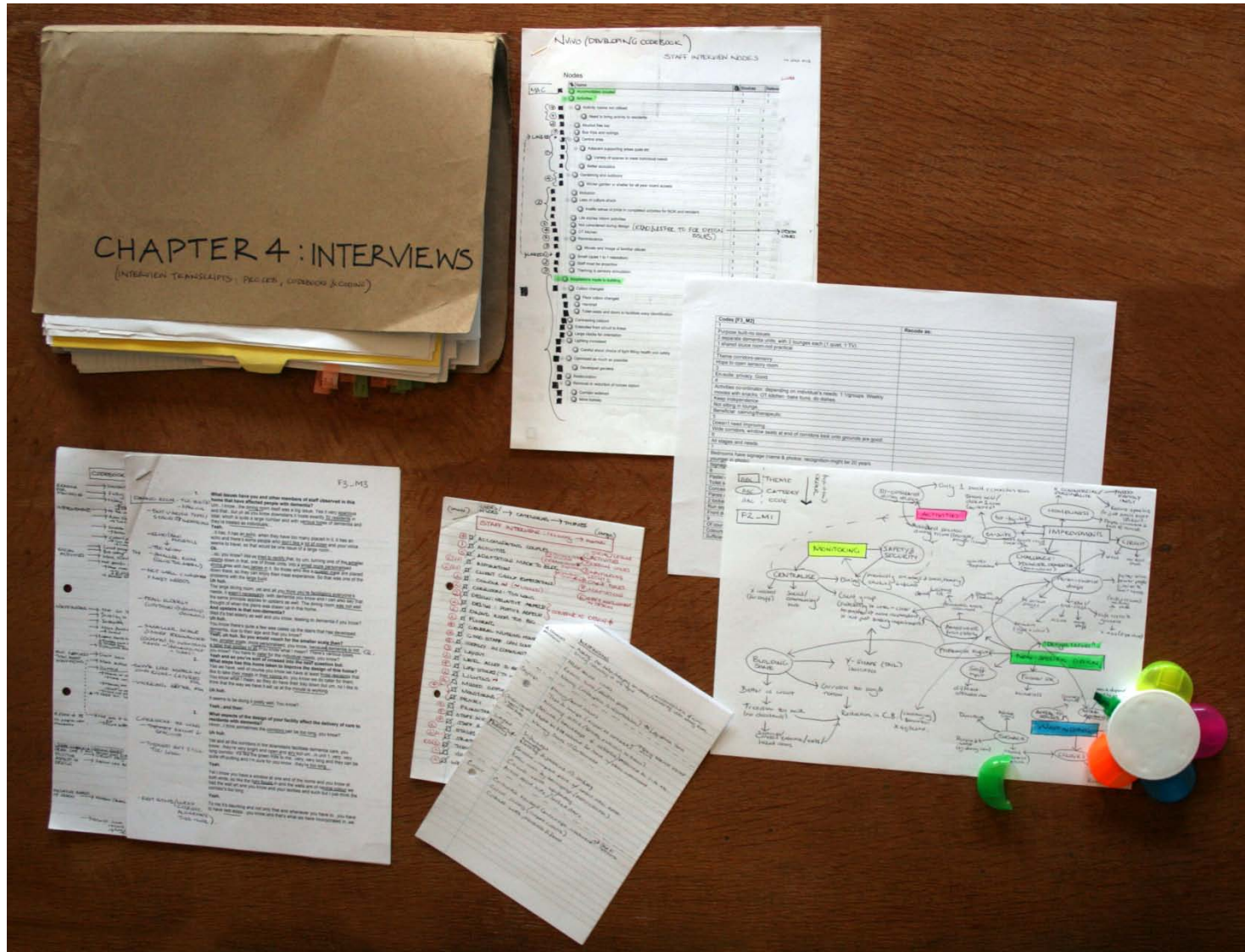


Figure 4-1: Interview analysis process.

A combination of hand written notes and NVivo was used to develop codebooks, themes and thematic networks.

To grasp how these were linked, thematic networks were developed relating to the staff (Figure 4-15, Chapter 4, p.116) and next of kin interviews (Figure 4-22, Chapter 4, p.132).

4.3 Discussion: thematic analysis of staff interviews

The following overall themes arose from the conducted staff interviews:

- Activities
- Management and care issues
- Design Issues
- Wayfinding

These will now be discussed in further detail, examining key issues and their implications. Please refer to the cognitive map (see Figure 4-15, Chapter 4, p.116) for a summary of the themes and codes which emerged as a result of the interviews conducted with staff.

4.3.1 Activities

The importance of activities: the role of staff and relevance to residents

Issues regarding occupation and activities were discussed throughout the interviews conducted with staff of the nursing and care homes. Activities were recognised as important and it was posited that it makes moving into a nursing or residential home “less of a culture shock” by continuing everyday life in a variety of ways. This instils self-worth and pride from their family in seeing results from completed activities. This has merit as it can enable visitors to come to terms with personality changes and help to deal with their own feelings of guilt after their family member has moved into their new home. The success of activities in these homes relies on staff motivation. It was identified that while an activity-nurse can establish a programme, other members of the team must be proactive in engaging and including residents in appropriate activity which is informed by the resident’s background (life stories).

In some cases, especially those who are in the later stages of dementia or have mobility problems, activities may need to be brought directly to the resident so features within the physical environment may become less relevant for individuals affected in this way. It was also recognised that personal interests and dislikes should be identified and those who did not want to participate in certain activities should not be pestered as they may not appeal to them.

Activities can be used as a reminiscence tool and incorporate food, film, music, images, dressing up and jewellery. This is also a form of sensory stimulation and may be therapeutic for residents participating in these types of activities. In some cases corridors and areas of the building were themed through decoration to provide visual and tactile appeal that was intended to relate to the residents. Many of the staff agreed that murals, items or places on show as part of the thematic display should ideally be familiar to the residents. Other activities such as games, bus outings, day trips, pet and doll therapy were incorporated into the activity programme. Activities were also recognised to play a role in sustaining skills and dexterity.

Features of the physical environment to support activities

An area of the design which enabled activities to take place was a large central space which allowed all of the residents to gather (Figure 4-2). This was particularly useful for parties and was described as having “better acoustics” and was therefore more suitable for such events. It was noted that many people would come to the larger common room or central area as part of their daily routine to socialise and that very few people would choose to stay in their own rooms. This was not because this was discouraged but because they seemed to enjoy sitting amongst others. In contrast to this, the need for a variety of spaces was considered to be essential to meet the individual’s needs. In some of the examples they had adjacent supporting areas to central spaces to provide quieter and smaller areas. This emerged to be especially important in circumstances where a resident required one-to-one attention, for example, to alleviate escalating behavioural issues which may have otherwise had a domino effect on other residents.

Specific elements within the building were discussed. Occupational therapy (OT) kitchens, alcohol free bars, cafes and shops have proven to be useful in the continuity of normal activities of daily living (ADL). In some instances, activities were not considered to be influential during the design of the home. This deficit should be overcome in future designs to provide a successful environment which predicts how activities will be carried out. The inclusion of separate rooms for activities must also be carefully considered so that they are used resourcefully rather than ending up “a waste of space.”



Figure 4-2: Large central area of F5.

This is used for events and has adjacent smaller areas which are supportive for promoting activities of daily living.

Access to safe and secure outdoor space

Gardens and outdoor spaces provide another therapeutic platform for activities. Raised beds are practical and can allow residents to interact and do some gardening.



Figure 4-3: Outdoor space: important for wellbeing and activities (Marshall, 2010).

Views to green spaces can help to create a more therapeutic environment. This garden space has practical raised beds and planting which appeals to the senses and can be incorporated as part of activities of daily living.

Outdoor spaces were regarded as important to allow freedom and access to fresh air. Shortcomings were reported relating to access which meant the access to gardens was not as free as was anticipated. Shelter from the micro-climate, adequate lighting and allowing for access all year round were important, not only to provide safe access for smokers but promote independence and uphold civil liberties.



Figure 4-4: Secure garden in F5 is visible when walking around the home.

4.3.2 Management and care issues

Caveat on environmental determinism: care issues must be considered alongside aspects of design

Care issues are important in creating a conducive social environment for dementia residents. As discussed previously in Section 4.3.1: Activities, a proactive carer has an essential role as part of a team in creating inclusion, promoting activities at an individual and group level. This issue was reinforced when it was posited that good staff can compensate for a poorly designed environment. Part of the delivery of care is maintaining dignity and promoting independence. Normal day functions such as going to the toilet or dressing independently were regarded as important in preserving autonomy and personal ability.

Changing needs: specialist care for dementia, new challenges and life stories for a better assessment

It was recognised that ideally people with dementia should be able to live and remain in the community, but with the large amount of support required and the cost implications, nursing and residential care homes become the only feasible option. Couples should be accommodated within the design of the facility and flexibility should allow for changing circumstances, such as separation if sleep becomes disrupted. This is often overlooked with the provision of rooms that are too small or designed only as single rooms.

“Life stories” were identified as integral to the success of a resident settling into their new environment well. These were mentioned in Section 4.3.1 regarding their use in relation to drawing up an individual activity programme which has been informed by the resident’s background, likes and dislikes. Ideally this would be conducted as part of a pre-admission assessment to promote easier settling. The use of life stories may reduce the need for medication and provide information on why a person is behaving in what might be perceived as a disruptive manner and allow for appropriate management and care. Pre-admission assessment allows staff to find out as much information about the person as possible but can be marred by the next of kin who provides much of the information if they are determined or insistent that they want them to live in a particular home. Some staff explained that this can occur when the person responsible for choosing where their next of kin will move to is attracted to a residential home rather than a more suitable nursing home as it is less of a culture shock. Therefore it is important to do the assessment so they receive the right level of support.

There is a need for general nursing homes to respond to the increase in people with dementia. Many of the general nursing homes are unable to cater for those with dementia so the resident must move if their needs change. Younger and more physically able people are now being diagnosed with dementia which poses a new challenge relating to space standards including: people’s expectations, allowing for monitoring in a secure environment which respects their human rights and dignity. Monitoring and security were highlighted in the instance of a young person who had dementia who was let out by another visitor who had assumed the young person was also a visitor.

An awareness of greater challenges was reported by some staff who described issues other than cognitive impairments with the client group in terms of greater physical impairments making them more dependent and an increase in the numbers of those who have dementia at a younger age. Residents are also coming in at more progressed stages of their illness as many of them remain living in their own community for as long as possible. Expectations have changed over the years and single rooms with en-suites are no longer sufficient. More space is required for personalisation and to facilitate those who are more physically capable, especially those who are younger and more mobile.

Monitoring and layout: staff continuity and risk versus quality of life

While staffing levels may seem to be less relevant to design, it does link to monitoring which can be enhanced by the layout and design of the home. Working with people one-on-one, conducting assessments and dealing with challenging behaviour can be staff intensive, so staff ratio was determined as an important care and managerial issue. Staff ratio is often dictated by resources and costs so design perhaps has a significant role in assisting with effective monitoring. Notably, the continuity of staff was considered as imperative to maintain and build familiar relationships with residents.

“... the continuity of staff, long term staff that know the patients inside-out and know whenever they sneeze wrong, that it's not right, you know... it's one of those more care issues. You need to create a hub... the nurses' station needs to be in the right place.” (F4_M1)

This was linked to successful diagnosis relating to other issues, such as urinary tract infections (UTIs), which may have been antecedent or triggered a change in behaviour or challenging behaviour. Knowledge of a resident assists the carer in deploying a response to challenging behaviour through distraction and de-escalation techniques.

Monitoring issues were discussed and are associated with features of the design. It is vital that all areas are observable both in terms of being seen and heard to ensure everyone is alright. Smaller units were considered to be easier for staff to monitor and business models tend to favour larger homes with 18 beds. This is particularly important during meal times when choking is a risk and at night time when falls can be problematic if someone gets out of their bed as they are more likely to be disorientated or feel confused. A suggested way of overcoming this was to provide a central area or hub where all parts of the design can be monitored and greater supervision can occur.

Smaller, zoned dining rooms had been relocated in some circumstances to a larger centrally located dining space to provide additional monitoring due to the associated risk of choking. The disadvantage is that the larger dining rooms tend to have acoustic problems, are noisy and not homely so can cause agitation and anxiety. Centralising allows for better communication between staff as they are not separated and isolated to wings, so staff resources may be effectively deployed.



Figure 4-5: A shift in the geometry in the plan of F2 causes difficulties with monitoring and communication for staff.

Communication issues were highlighted regarding kinks in corridors which prevented surveillance and wall thicknesses and their finishes which have caused problems with mobile communication systems (Figure 4-5). With regards to the nurses' station, it was felt that it was better to conceal it and make it discrete to create a more homely feel. Homeliness was considered by staff as an important issue to allow residents to settle and feel connected and familiar with their surroundings.

"The homeliness of the living rooms is important... they say 'I've no room for all these people to sleep here tonight' and in a way, that is a good thing because they feel it's their home." (F2_M1)

In a particular home, it was proposed that residents should have access to staff supervision, even during their breaks. Design should therefore consider this and create an environment which facilitates this whilst providing a pleasant environment for staff to feel refreshed.

Some homes described how the zoned residents in accordance with their level of dependency, so those who were more dependent were ideally located more centrally for closer supervision. The layout was discussed with reference to design issues and monitoring. In the F2 building (Y-shape plan), staff contended that it would have been better as a circuit plan to allow for freedom of movement with security and avoid locked doors which would ultimately reduce instances of challenging behaviour. It is however necessary to provide a secure environment for those who are at a high risk to themselves but locked doors should be hidden away from view or concealed where required.

It was stressed by staff that risk must be considered against quality of life. For an individual resident some things may be seen as assets, but for others they may carry a risk. The realisation that life carries accompanied risks reinforces the importance of monitoring. Therefore risk assessment is at the heart of managing issues which may arise. Civil liberties must be taken into account alongside the unpredictable nature of dementia which means a resident may be lucid one moment but later become a danger to themselves the next. This was highlighted in a home where some of the residents are still capable of going to the local shop, but cannot because of the accompanied risk and need to keep the exits locked to prevent other residents from walking out who are likely to cause themselves harm. In this case they have considered recognition technology, such as thumb printing which is currently being trialled in other homes to allow certain residents the ability to freely enter and exit the home.

The role of assistive technology

Assistive technology is recognised as a solution to some of the areas which prove to be more difficult to monitor. At night they may be employed to monitor the bedroom, this may consist of pressure pads on beds and door alarms which would notify staff about movement. Fall detectors and chair monitors are particularly useful for people who are prone to falls. Staff highlighted that this needs to be individually assessed and may not be suitable for everyone. Some residents did not like the idea of having this technology monitoring them and because it caused anxiety, it was removed to respect their decision and rights. This caveat does raise privacy issues regarding assistive technology. In some homes, life stories are displayed as information outside residents' rooms to provide a brief history and understanding of the person. Although this is useful in communicating and assisting with care, some people do not like this on display as they may prefer more privacy and this is respected.

This is similar to those who do not like having assistive technology in their room but by respecting the individual's privacy it does come with a risk that they will be alone behind closed doors. Personal en-suites were preferred as they were considered to uphold dignity and provide convenience.

4.3.3 Design issues

Outdated, missed opportunities and non-specific design

Staff input into design is desirable, although it is not always accommodated. In some cases staff were involved in the design stage and they were consulted by the design team but years later the attitudes had since changed or they had moved on from that place of work. A number of staff felt that their buildings were outdated or not dementia specific. Even in homes which were described as "purpose-built," it further transpired that they had not specifically been designed for people with dementia. It was suggested that frailty and mobility issues were probably greater considerations within the design framework rather than cognitive decline. Certain homes were designed in a way that staff had no participation in the design process. The design process involved looking at other local homes as precedents and using them to inform the design of a new home. More successful involvement included homes with a proactive director who engaged well with the architect and questioned things from a carer's perspective which allowed for innovation to occur. Expensive errors were sometimes made when purchasing artwork and paintings as part of common area decoration where they were considered to be irrelevant to people with dementia or those with visual impairment. The issue of not being dementia specific extended beyond the design where it was acknowledged that some homes have re-categorised from general nursing homes to meet the need for specialist care thereby rendering the design not fit for purpose. As a result, people have had to adapt as it is not feasible to alter aspects of the structural design once construction is complete.

Design should be considered holistically from the start, enquiring how space will be utilised and predicting how expectations may change in the future. The cost of building or renovating can prove very costly so one should consider life-time costs of the building, including heating bills and sustainability issues. Staff reported on a variety of other missed opportunities with regards to the design. Many of these were unexpected and it was explained that even if all aspects of the design have been covered, it is not possible to predict how people will use the building. Gardens were frequently overlooked in terms of adequate free access to a secure space. This was even evident in homes which were on generous rural sites where there was opportunity to offer a larger expanse and range of outdoor spaces (Figure 4-6).



Figure 4-6: F4 is located on a rural site with large grounds and has an enclosed courtyard garden, however the landscaping is not fully realised. In many cases free access is limited or poorly located.

Design flaws and adaptations

Adaptations have since been made through refurbishment and redecoration. Some more permanent design choices have had to remain where it is not feasible to correct. This was true in a home which had two units or sides and even though they were of equal size, one unit had fewer people and an uneven distribution of facilities including an OT kitchen and sensory room. Homes are frequently redecorated as part of the maintenance. Colour was changed in building F5 on the floor which may be used for wayfinding (see Figures 4-8, 4-9 and 4-14). Handrails were replaced with solid wood which still contrasted as the finish of paint of the previous one had flaked off and became unsightly as residents tended to pick at it. In the majority of homes toilet seats had been replaced with red or blue equivalents to facilitate easy identification. Improvements were also made to colour schemes to ensure contrast in tone to improve spatial perception. Large clocks and orientation boards were fitted. Lighting levels were also increased to help facilitate those with visual impairments. Many of the homes discussed the removal or reduction of the size in the nurses' station to make the place more homely. This presents a problem as staff must now place their paperwork elsewhere to keep the place tidy but it has additional resulting benefits from the alteration such as wider corridors and new seating areas which act as important rest stops (Figure 4-7).



Figure 4-7: Long corridors in F3 with rest stops.

Rest stops were placed along formerly wide corridors which has consequently reduced the breadth and created obstacles for residents.

In the case of building F4 they had built an extension onto the original circuit plan which made it more linear in shape (the implications of this are discussed in the matrix which analyses the design, see Table 3-4, Chapter 3, p.74). Staff described the process of making improvements as iterative, over a long period of time when funds were made available and it was felt that the building and garden spaces had been optimised as much as possible. Storage issues, sluice rooms, the number and locations of electrical sockets were common issues reported to have an effect on the ease of the everyday running of the home from the staff's perspective.

A range of design flaws were reported during the interviews. In building F3 the dining room was found to be too big which created acoustic problems, including echo and noise. The room catered for 32 residents which was described as intensive and staff witnessed communication problems. The home has since been adapted to provide a smaller, quieter dining space which splits the number of people up improving the meal time experience. Corridors were regarded as too narrow and emphasised issues of crowding which can present cases of challenging behaviour due to the stress felt from this. Another related concern was that the corridors were too long which is daunting if people have mobility or respiratory issues. Initially the corridors were generous in width, however rest stops were incorporated which has consequently reduced the width thus inhibiting movement.

Safe, secure level access and flooring

Flooring choice consisted of avoiding dark coloured or heavily patterned flooring as these can be perceived as holes in the ground and in the case of patterns they can restrict movement or appear as dirt. Flooring should look welcoming, homely and be easy to maintain. Carpet might be considered homely but it poses cleaning issues and has greater friction than other surfaces which can affect the physiology and mobilisation of the residents. A difference was noticed in a home where they had upgraded one side of the building to a wood effect laminate where residents appeared to walk faster than when they were on the carpeted side.

A level continuous access to avoid steps is essential and lifts should be avoided as they can cause agitation and confusion. It is best to be on the ground floor because residents feel more connected to the ground and do not feel the need to get downstairs.

“I also wonder why nursing homes put people with dementia on the first floor, there is no access to the gardens and there’s no need to hide them away...it’s as if they’re doing that though.” (F3_M2)

In addition, there should be good safe and secure access to outside space, ideally from a number of areas and allow for staff monitoring. Locked doors and entrances/exits should be avoided to prevent people from feeling agitated as it seems they are not allowed out.

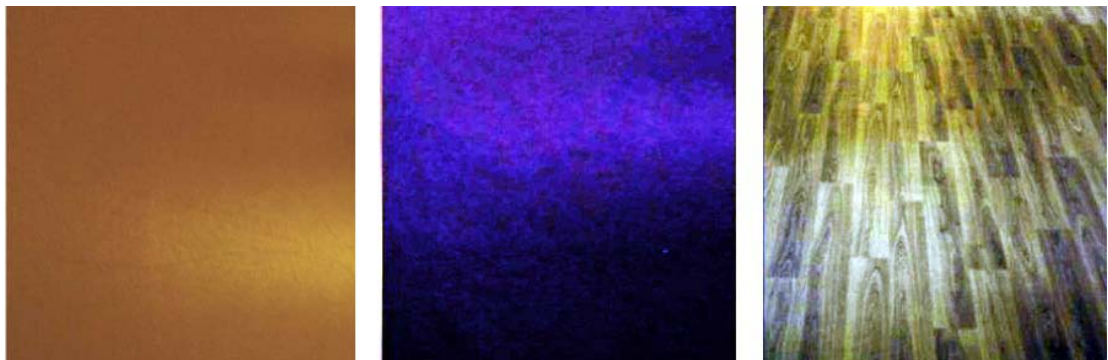


Figure 4-8: Plain un-patterned linoleum flooring (left), carpet (centre) and wood effect linoleum (right).

Mobilisation and physiological issues should be considered as well as aesthetics and homeliness when selecting a suitable type of flooring.

Positive attributes of design

Positive aspects of the design reported that corridors were wide which allows people to pass one another. In most cases the corridors were double-banked meaning that natural light was compromised. Wider corridors were deemed to be important as they facilitated wandering (or exploring) and reduced incidences of trips and falls. Natural light was highly regarded as important for maintaining circadian rhythm and providing desirable views to outdoor spaces such as the garden or surrounding scenery. Bedrooms with large areas of glass were favoured with a desire for full height glazing also being expressed.



Figure 4-9: Double banked corridor in F5 with tonal change in carpet to demarcate different zones.

Double banked corridors were described as a shortcoming in F5 as lighting levels are reduced and they do not provide glimpses to other parts of the building.

Lighting is important for enabling residents to maintain good sleep patterns following circadian rhythm. Artificial light and different colours of light had been used as a form of sensory therapy. High levels of light were described as being necessary due to visual impairments associated with the ageing eye. The purpose of this is to make things more visible and obvious which has an effect on wayfinding success. Energy saving light bulbs were described as inadequate as these require time to warm up and the lux levels degrade over time.

In projects which had insufficient light, some of these which have undergone refurbishment have targeted the issue of lighting due to how pertinent it is and replaced light fittings (Figure 4-10). Linked to natural light is the obvious issue of controlling glare, solar heat gains, providing a system for thermal comfort and ensuring adequate ventilation. An anomaly within the responses was that large areas of mirror glass were used to add to the illusion of space and increase levels of lighting. Others felt that this should be avoided because of the distress people with certain types of dementia such as Lewy body disease experience with hallucinations. In fact, in many cases the homes had removed mirrors or had them installed in such a way that they may be covered up.

Linked with lighting, is visual impairment which is commonly associated with ageing and also the perception of colour. Colour has a role in enabling things to be easily identified. Features such as signage and tonal contrasts can assist with spatial awareness and differentiation of the handrails from the wall and the walls from the floors. Generally bold, primary colours were thought to be the easiest to see, however there was some value in pastel colours to subtly highlight areas such as bathroom door colours. In parallel with this, the need to control the palette of colours and to not over-stimulate was raised as it can agitate and cause confusion. It was suggested that a restricted colour palette used in key areas may be more appropriate. Colour used within decoration is cost neutral but its effectiveness is difficult to investigate as individuals will perceive things differently due to cognitive and visual impairments.



Figure 4-10: Adaptations to F2 shown in the image on the right.

Adaptations include improved lighting through increased lux levels, personalisation of bedroom doors and the addition of murals.

Meaningful places to sit, for instance window seats with a view to the garden to bird-watch were preferable to provide resting points. An important issue raised was that ideas that have shown to be successful have been transferred onto other projects. However, the reporting of this knowledge does not always go beyond the realms of the individual service provider. The importance of ensuring successful design of the physical environment has, was also acknowledged:

“I couldn’t imagine how people would live day-to-day without the right colours, signage and the OT kitchen that we have. The residents would be lost, disorientated and anxious without it... and without good design it would have a domino effect, if one person is getting anxious, it stresses other people around them and before you know it, staff included would all be disrupted.” (F3_M2)

Design should go beyond meeting the client’s needs and provide a therapeutic environment which enhances their quality of life and wellbeing. Since there are limited guidelines for design for dementia, it is also necessary to go beyond Building Regulations. This was obvious in many of the homes with design issues such as corridor widths being too narrow as they were based on minimum standards.

As discussed in Section 4.3.1: Activities, outdoor spaces and gardens require shelter and shade against the weather and should have artificial lighting for winter and night access. Water features were desirable but difficult and expensive to maintain, so it was questioned whether the same therapeutic effect could have been achieved using a smaller intervention. Appropriate surfaces should be provided to enable safe level access with a minimised risk of falls. A missed opportunity was reported with a courtyard garden which was surfaced with tarmac, so did not appear as pleasant to sit within. However, it was felt it was too expensive and difficult to rectify. The value of outdoor and green space should not be overlooked in terms of design. Residents should possess the right for free and safe access.

Decoration and visual cues

Decoration and themed corridors were discussed as an element used within activities but in terms of design, this can also provide interest in the interior design, appealing to the senses and act as potential environmental cues to assist wayfinding. Murals and fittings used for theming should be considered with regards to clientele interests to ensure they are relevant to them (Figure 4-11). In addition to this the interior should feel homely and allow space for personalisation in resident’s rooms or flatlets. Soft furnishings (which are washable for practical reasons) are preferred to clinical furnishings.

Stages of care

All homes catered for the various stages of dementia. It was recognised that this factor and individual needs have an implication on design. People with earlier stages of the disease were considered to be more mobile and able to interact with their environment, so places like kitchens provide a place to maintain their abilities. People who are in the moderate and later stages of the disease generally possess a reduced capacity to carry out focused tasks and benefit from tactile and sensory stimulation. Specific sensory rooms or snoezelen were preferred, although staff indicated that lighting and sound equipment used for this therapy can be brought instead to a quiet room or the individual's bedroom. Some homes stated that they cater for all needs but feel they should cater for those who have the greatest cognitive functioning to provide inclusion. They questioned whether other homes would have the same approach or whether some people may be left sitting idle as the focus in some nursing homes would be towards end stages or more progressed forms of dementia.

Several homes discussed the concept of an ideal unit which would be built and zoned on dependencies. Ultimately this would provide smaller numbers in separate units with a variety of spaces for activity and therapy. Staff training is important to ensure a person-centred care approach because it is recognised that every single person with dementia is different.

“... smaller scale, more personalised, you know because dementia is not a label that applies to all... You have to cater for the individual's needs, you know.” (F3_S1)

This reduces negative symptoms of the disease which can have a domino effect on other residents if one person is not happy. Atypically there was some discussion that certain homes are specific to a certain stage of dementia as they are not appropriate for someone who is in the later or earlier stages as respectively they would not receive the high dependency level of care they need or they would be left sitting idle and not stimulated. This links back to management and care at the assessment stage of admitting someone into a residential or nursing home and once again it was recognised that family can be influential in this decision which arguably may not always be the right one. Later stages of the disease are linked with communication problems so often staff must pre-empt what they need. In all cases routine was deemed to be extremely important so meal and activity times should be adhered to as this prevents agitation and challenging behaviour. Many residents were reported to have a preferred sitting place and chair.

Site selection, planning and community integration

Community support was fundamental in the success of these homes and the ability to liaise with the various members of the multi-disciplinary team. Site selection should be carefully considered as it should be convenient and accessible to supportive services such as primary health care facilities, hospitals, pharmacies, shops and bus routes. This is all part of successful integration into a community and these issues of inclusion are often overlooked. Neighbourhood relations were reported as problematic and some homes experienced vandalism and verbal abuse from people in the surrounding area. Community groups are often key in resolving tensions of this sort and dispelling social stigma. The service must be equitable to all people from various backgrounds and not politically polarised to a particular community that would alienate residents or their visitors. In homes which are planned within new urban housing developments, it was described as difficult to predict how they might evolve in the future, both in terms of available services and acceptance or inclusion within the community. Whilst appropriate, site planning and response to context always enhance design, staff frequently expressed that key aspects, views and basic orientation rules were ignored. Staff from building F3 explained that the sun path is to the front of the building but the garden space was placed at the back in the shade. Site selection, planning and orientation must be better considered from the onset of design.

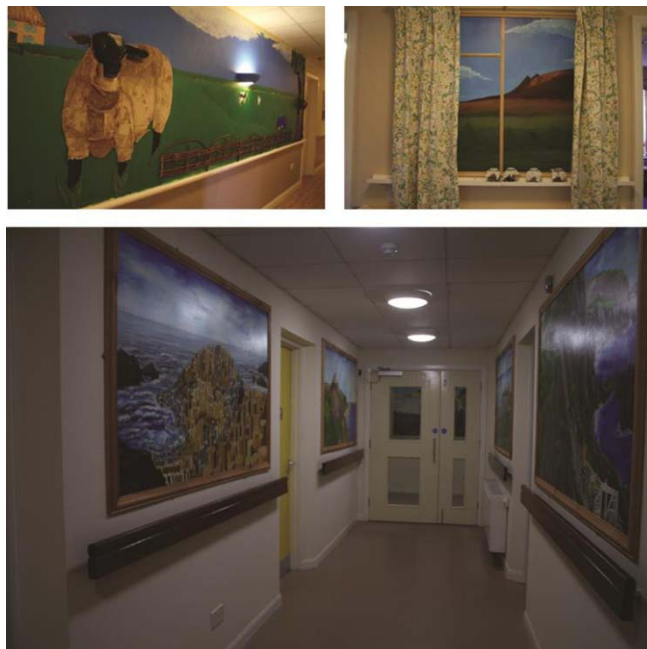


Figure 4-11: Murals and tactile displays appeal to the senses.

A selection of images from the different homes depicting how areas have been themed through the use of murals and tactility. These may act as environmental cues for some residents.

The purpose of rooms should be evident in the decor as it is considered to be important in the correct identification of rooms and may assist wayfinding. Room sizes are important to allow for space to move, assist and personalise. This is applicable to bathrooms and bedrooms but is frequently ignored as a cost cutting exercise.

Expectations for the future

Aspirations for the design for future dementia care homes had a strong connection to client group expectations. The discussions surrounding these issues raised regarding the changing needs if the group who were more likely to have been familiar with larger room sizes and better facilities, such as access to a gym. Disappointment was expressed with regards to inadequate room sizes from one of the managers:

“... we found it quite challenging eleven years ago fighting for the space we got within the flatlets. I think it's unacceptable...that's my personal opinion, but I think it's unacceptable to expect an older person to move into a room and an en-suite.” (F5_M1)

In many cases the homes were outdated in terms of space standards and bedrooms were described as inadequate in size to provide opportunity for personalisation. It is part of predicting how standards will change and future-proofing the buildings. It was imagined that people coming into homes in the near future will expect access to services and facilities like a gym which are not usually part of the buildings. Successful models may need to consider providing this as part of a community initiative to create a feasible model and adequate funding for this.

The role of good design of the physical environment was described as vital due to the associated benefits which can be therapeutic when light, gardens and water are incorporated. Recommendations for improving these homes included smaller numbers and having greater freedom to move and enjoy the larger spaces. Funding is frequently believed to be responsible for compromising elements of the scheme so supplementary community facilities or greater investment are also required.

4.3.4 Wayfinding

A common problem

It was unanimously acknowledged that difficulties were persistently experienced by residents trying to find their way around. This manifested in the form of directly asking for help, for example asking “Where's my bedroom?” or “Where's the toilet?” and witnessing people who found themselves in the wrong bedroom.

Some residents were described as having a limited capacity for orientation in terms of time and place and were reported as stalling or standing on the spot as they are unsure of where to go. In contrast to this it was recognised that during certain times, certain residents are very capable of successful wayfinding. Staff discussed how they encouraged independent wayfinding through reassuring residents and allowing them to ask questions which gave them assistance to work it out for themselves. Common wayfinding issues include misidentification of their bedroom/flatlet, forgetting addresses/room numbers and incontinence due to being unable to find the toilet. This is a key issue linked with providing privacy and upholding dignity. En-suites are viewed as simplifying the problem as they are conveniently attached to resident's rooms. The difficulty in providing instructions on how to get to a bathroom further away was explained as being perceived as too complex a journey. The implications of this mean that challenging behaviour may arise and affect resident's wellbeing due to anxiety, frustration and feeling frightened, which are all difficulties reported by those with dementia experienced during wayfinding.

When someone moves home, this can cause stress, sleep disruption and affect the resident's wellbeing. It is best to avoid moving room or home if possible, however this may be unavoidable due to changing needs. It is therefore better to remain in place, although this is not always possible as was illustrated in a residential care home with supported living accommodation. They explained that if an increased level of care was required, then the legislation stipulates that due to funding, the resident must physically move. The legislation contradicts the ideal scenario where a person would remain in place once moved in. This also has implications on personalising or furnishing the resident's room as this has raised fire safety concerns. It was determined that while this is set out to safeguard residents, there needs to be greater dialogue to prevent legislation from impeding on the creation of a desirable environment.

Signage

Signage seemed to be a widely deployed technique used as a supportive wayfinding aid. Some discussion centred on the need for signage to be obvious due to visual impairments and yellow backgrounds with a black border or bold primary colours were preferred based on previous research carried out and recommended by DSDC. In a refurbishment, signage was improved by increasing it in size and placing it at an accessible height which was intended to make it easier to read.

Pictorial signage should be used in addition to text, this worked well with common areas such as dining rooms where a fork and knife would be depicted with the words. Some people were able to identify their rooms better if a familiar picture of themselves (this may be from years ago) was placed on their door. Naming areas of the building after relevant places was a feature which produced good results.

“... what I do find is that the numbers and street names you know... for some is good orientation... they have a home address, so that is a way of finding their way from one area to their flatlet as well...”
(F5_M1)

The capacity for wayfinding was said to be due to the resident’s knowledge of their given address for their room and this seemed to be memorable in some cases, for example when a participant would say “I’m 4 Main Street.” There appeared to be a greater success in homes which used addresses that were meaningful to the residents as opposed to naming areas “unit one, rooms one to sixteen,” for instance. Signage is particularly helpful to allow people to recognise what is behind closed doors, this is especially true for bathrooms or toilets and can provide a role for promoting independence, dignity and alleviating incontinence issues. The caveat with signage is that those with severe visual or cognitive impairments may miss it. It is however useful for those who still possess the capacity to be independently mobile and can identify with text or images which has been shown to assist with wayfinding.

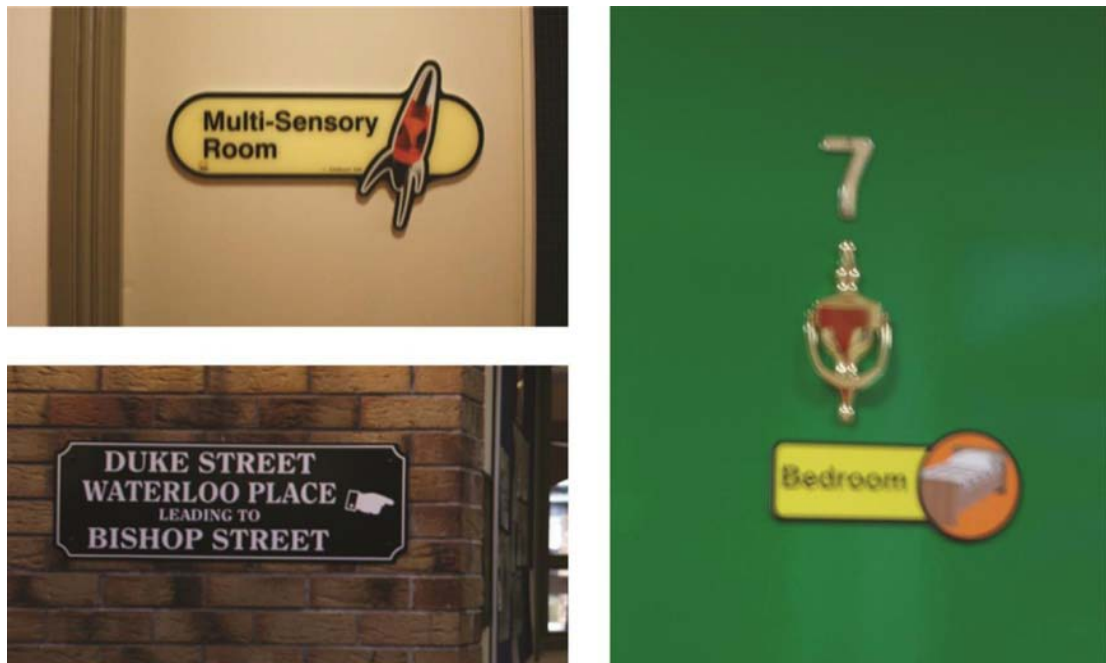


Figure 4-12: Effective signage should include text and pictures.

Room numbers seemed to be used as part of a successful wayfinding strategy.



Figure 4-13: Wall mounted memory box in F5.

These seemed to be less successful and cause issues of privacy with some residents who did not wish to have personal items on display that would identify them. These were also deemed as obstacles as residents would walk by and bump their head on them as they used the handrail. In other schemes which has recessed the box into the wall, feedback was unsuccessful as residents seemed to miss them or not see them

Memory boxes have been used as a reminiscence tool, designed specifically to hold contents which are personal to the residents. These are usually placed outside resident's bedrooms to assist with finding their room. It may have their name and a synopsis of the past (based on their life story). It is normally left up to families to take the responsibility of filling the memory box as some people may not want to use it as it may be considered invasive. Issues with these were reported as they protrude out from the wall and were at eye level which meant that some people have bumped their heads on them as they walked along. To overcome this, the edges were protected by plastic guards or rounded. Recessing the memory box was trialled in a newer home, however it was reported that this was not seen as it became hidden within the wall so interaction was reduced. Items within the boxes were often removed or lost so these were quite empty at times and required frequent replacing. Considering these matters, memory boxes may be of limited use in promoting independent wayfinding.

Layout

The layout was considered to be influential on wayfinding success. It was posited that corridors tend to encourage movement but when a junction is reached (for instance a T-junction), where a decision is to be made to turn left or right, the resident may pause or struggle to go in the right direction. Some responses speculated that smaller units are better, not only for easier monitoring but also to enable compact plans and simple wayfinding. Other layout issues include lines of symmetry and mirroring within the plan. If the wrong decision is made at a major junction it means that the resident crosses over to the other side and identifies what they think is their room but become confused, anxious and frustrated when they are unable to identify any of the personal belongings or furnishings when they open the door. This was illustrated in the following quote:

“... for example, one of the wee ladies crossed over to unit one (*regarding mirror image design*)... well... she would find the location of her room but of course it wouldn't be her room... but once they open their door and they realise... they start thinking... I'm lost.' Because they don't recognise the... anything that's there belonging to them.” (F3_S1)

The problem of mirroring is also encountered in bedrooms where walls are shared and the plan is reflected to provide space for the en-suite (one of these usually ends up very dark as it becomes an internal bathroom with no outside wall). This becomes a greater challenge if for some reason the resident is moved, for instance to redecorate their room. It was believed that the circuit type plan was better to assist wayfinding and reducing challenging behaviour. As mentioned previously, circuit plans allow for freedom of movement to explore or walk, avoiding locked doors, dead-ends and providing a safe and secure environment. Although these are positive and would alleviate symptoms associated with dementia and feeling locked in, criticism was noted with the circuit plan in relation to physically burning out. This may be experienced in the case of people who were manic or bi-polar. In a building which had a circuit layout adjacent to a straight corridor, staff felt that the circuit part of the plan was underused compared to the long straight corridor.

Colour

Features within the physical environment which were discussed with regards to promoting movement and wayfinding were handrails and colour. A continuous handrail encourages movement and provides additional stability whilst minimising the risk for someone who feels unsteady on their feet.

Handrails were described as being used at times by people who did not really need them and it was observed that they walked for longer and stopped at apertures where the handrails end at particular rooms, giving the opportunity to decide whether they wished to enter. Colour coding doors, handrails, corridors and other areas may help residents to identify places and highlight toilets for example. Carpet colours were renewed during a redecoration as it was hypothesized that many of the residents were observed to look down at their feet. The tonal difference was not enough to be problematic or perceived as a step, rather it was used as an environmental cue to assist with wayfinding.

“... what has changed this time around is that the carpet colour has changed as well, whereas it wasn't before... we just wonder how often they look at the handrails when they're moving and whether that it's the path, a way of orientating or do they look at their feet more, you know? And if the carpet changes on the floor, it may be clearer for them.” (F5_M1)

It was found that some of the residents refer to knowing where they are because of the colour of the carpet, for example the bedroom is in the green zone. Light switches which have an illuminated frame or night lights were described as useful at night time to help with orientation, especially for those with poor eyesight. Design is ocular-centric and often neglects those with visual impairments so there is a need to accommodate and appeal to other senses, especially in those who have additional cognitive decline as their perception is affected and they may experience hallucinations.



Figure 4-14: The carpet colour was changed as part of the adaptations in F5.

This was intended to be subtle so it would not be perceived as a step and has had a positive outcome where some residents (especially those with walking aids) know they are coming into their bedroom area due to the colour of the carpet.



Figure 4-15: Cognitive map showing a summary of the themes and codes which emerged from the staff interviews.

4.4 Results from interviews with the next of kin

The following overall themes emerged from the interviews conducted with next of kin associated with residents who participated in the wayfinding walks:

- Activities
- Management and care issues
- Design Issues
- Wayfinding

These will now be discussed in further detail, examining key issues and their implications.

4.4.1 Activities

Continuity of social life, skills and independence

Similar attitudes to staff responses were conveyed by next of kin regarding activities. They considered this an important part of continuing everyday life, which helps maintain independence and skills, which in turn reduces anxiety by giving variety and avoiding monotony. Suggestions of how this has been incorporated into successful activity programmes were: a functional kitchen, alcohol-free bars, bus outings, in-house hairdresser, exercise and reminiscence based activities which can stimulate the senses (such as music and old items of interest).



Figure 4-16: The shop area of F5.

This area was noted to provide sensory stimulation, reminiscence and create an ambience in the building.

In some cases visits from children were believed to have a positive effect on the residents. Some interviewees proclaimed that they felt their next of kin were sometimes sitting idle and felt there could be more in the way of activities, although they did realise that this is staff intensive. Related to this, staff turnover was in some cases described as high due to the pressure of the job. This was considered a disadvantage and emphasised the need for staff continuity which was also an issue highlighted by staff. Next of kin explained that activities did not necessarily need to involve the staff providing a form of entertainment but could include taking the resident for a walk which would help with their mobility.

Promoting wellbeing

From a positive point of view, it was generally considered that there was a good activities programme in place which promoted social interaction. Activities were widely regarded as being beneficial by having a positive impact on wellbeing.

“... it’s a wee bit like having a nightmare and waking up in the morning and you’re agitated... you can really remember what the dream was about... I imagine that going out and doing nice things...helps your mental wellbeing because you’ve been put in good form... so I think if they enjoy it at the time, it doesn’t matter if they can’t remember it... because obviously they’ve had the enjoyment of those couple of hours.” (F5_P1_F1)

This description of how dementia affects short term memory recognises the value of activities and their impact on the resident’s wellbeing despite perhaps not being able to recall the event which had taken place.

The role of the physical environment

The physical environment should facilitate this and make visitors feel welcome so they will be encouraged to return frequently. In conjunction with this, the layout and facilities should provide areas for the aforementioned activities to take place. Homes which have a large central area often used this for events or gatherings as it is larger and can accommodate everyone. This was regarded as particularly successful in F5 where next of kin explained that the variety of adjacent spaces, such as the bar, smaller living room and cafe were supportive and provided quieter areas if one-to-one attention is required.



Figure 4-17: Space use for activities in F5.

The darkest tone shows where group activity takes place in the central area, which is supported by the lighter shaded adjacent areas which provide smaller scale, quieter areas and additional activity areas are indicated by the lightest tone.

In homes which did not have a specific activity room there was some concern expressed when other rooms, such as the dining room were used as a dual purpose room to accommodate activities. This was due to the issue that it may be confusing for the residents and it may have been better to have a specific room so that it becomes associated with events only. Other complaints with homes which did not have facilities for activities was that it made it feel more like an institution.

“... I think they don’t really have anywhere for social activities here... everyone goes to the dining room and I think... it’s not a good idea... I would rather somewhere specific... Because it keeps them from getting... confused... I do think there should be access to outside from your own room... as lovely as this is... there’s no facilities. It’s just an institution, you know.” (F3_P1_F1)

Encouraging movement and walking exercise was deemed to be important and the layout and zoning of a building should support this by providing space to move around and not feel as though they are excluded from certain areas. Access to gardens should be provided as this was broadly regarded as inadequate or missing from the homes. Avoiding stairs and lifts was mentioned again as this can cause confusion so it was suggested that the homes should be designed to be all on one level and at ground floor level as this also helps to promote freedom of movement.



Figure 4-18: Zoning of F5 to enable free movement and accessibility.

This diagram indicates how F5 is zoned to allow freedom of movement and secure access to outdoor space. The lack of dead-ends and carefully located staff-only areas create a sense of liberty.

4.4.2 Management and care issues

Reasons for moving in

Next of kin discussed why the decision was made for the residents to move into a nursing or residential care home. Many of the reasons gravitated around concerns for safety combined with the need for additional support and monitoring. In some cases technology was not being used properly; one next of kin explained that the heating would be switched off and TV was left on all the time. Other issues related to malnutrition (because of forgetting to eat) and the risk of starting fires or flooding their homes because they were living alone. By moving into nursing or residential homes, these softer issues were taken care of, making life simpler. Other families had attempted to move the person with dementia into their own home but described the difficulty and pressure of caring for them adequately, especially when issues arose regarding the health of the primary carer. Increased falls, sundowning, challenging behaviour, hallucinations and wandering were complex problems which posed a definite risk to the wellbeing of the person with dementia. Some residents had lived in other general care institutions but the care was not orientated towards dementia or the facilities were inadequate.

It was reported that a resident had lived in a previous dementia home but their living accommodation was upstairs and this caused confusion as they felt the instinct that they should be on the ground floor. This reflected a point that many of the staff made when interviewed, that dementia residents are better to have level access on the ground floor, thereby avoiding stairs and lifts as these can be disorientating. In some cases, due to the facility being classified as a "general" unit, rather than dementia care, it was felt that their relative was "forced out" of the home because of the burden the resident presented to them. This unfortunate circumstance consequently led to great disruption and unease from moving which is considered best to avoid. There was expression of initial guilt when the difficult decision was made that their next of kin should move in,. However it was reported that this was outweighed by the benefits seen in wellbeing and safe-guarding.

Monitoring

The need for extra support and monitoring were at the forefront of reasons for moving in. Assistive technology was available in most of the homes which offered reassurance. The use of these alarms was to detect movement (for instance bed alarms or for wandering) and to predict risk of falls. While these are useful in assisting a ubiquitous form of monitoring, which would help to ensure the safety of the residents, it is important to acknowledge that there are associated privacy issues. This was highlighted in the case of a resident who found her bed alarm intrusive, so it was removed due to her expression of anxiety, suspicion and paranoia. Fortunately this lady held the ability to verbalise her feelings but this may not be the case for others.

Focus on dementia

The nature of dementia was regarded as changeable, for instance the person can have moments of clarity within their confused state. Some interviewees described episodes of confabulation which their next of kin used as a coping mechanism, this was also supported by staff in the home. This consisted of the person with dementia concealing symptoms of the disease. This made it difficult to determine whether they were affected by dementia as they seemed to function well and spoke in a lucid manner but often with generalised responses. Interviewees expressed their belief that whilst people are now more aware of dementia, there is still a stigma surrounding it, whereas previously people would have considered it to be "doting." The benefit of this was expressed as person-centred care is used and the increase in dementia research.

The importance of care

Responses from next of kin had parallels with staff who recognised the importance of establishing a routine. They referred to how it can be distressing if routine is broken and how they prefer certain chairs and times for meals. It was also reported that when taken out for the day, the person with dementia expressed that they wanted to go home. Some interviewees considered it to be important to separate stages of care within the layout of a building due to the domino effect which may be experienced by other residents becoming distressed. Staff also discussed this point but deemed it difficult to do as it meant moving people so perhaps smaller units would deliver focused care to all dependencies.

“I think the real plus... it's nothing about layout, the staffing is absolutely brilliant... her key worker is excellent... they're very good at communication... they notice little changes in her...like an infection...the infrastructure that supports her is very good... district nurses, GPs, podiatry, optician... and then they do entertainment as well from that sort of softer side... it's good for your mental health to get all of that.” (F5_P1_F1)

The above quote illustrates an important point which was also raised by staff. Although the physical design of these homes was highly regarded, the importance of good care was paramount. Again familiarity and continuity of staff was raised as it enables efficient identification of any problems the resident is experiencing and puts them at ease within their environment. This can assist with understanding potential causes of challenging behaviour. The physical environment also has a role in providing sensory stimulation at a controlled level which can have a calming effect and alleviate negative behavioural symptoms associated with dementia. Key workers are imperative to deliver a person-centred care approach, especially when one-to-one care is required. Praise was noted for the standard of care provided in all cases which promotes dignity, even in cases where challenging behaviour is considered to be an issue with a resident. The next of kin of one of the relatives in F5 articulated the significance of maintaining staff morale through respect between staff and in this instance the management team set the tone and created a pleasant working environment:

“Also I think the staff are great... you wouldn't know who is management, there isn't this level of hierarchy either.” (F5_P5_F1)

4.4.3 Design issues

Benefits of the physical environment

The view that carers should have more of an input into design was also held by next of kin as they can examine how it might work based on their experience. Generally design was considered to have a direct impact on the wellbeing of residents with dementia with the exception of a few who felt it might be less relevant for those who are in the very late stages of the disease. Once again moving people with dementia was described as disruptive, but in spite of this it was acknowledged that since they have moved into a dementia specific home, it has had a positive effect and they have since settled in.

The physical environment can provide stimulus in the form of lighting, sound, colour and decor, but should not over-stimulate. Designing for dementia was seen as advantageous for others and can enhance wellbeing for all. Since moving into a dementia specific nursing or residential home, many of the residents were described as having improved mobility, less breathlessness, reduced incontinence, less distress and improved orientation. In most cases there was some room for improvement, including better access in a safe environment to promote freedom of movement and improvements to promote wayfinding. While there was some feeling of momentum to improve things for people with dementia, next of kin described how it may take greater economic investment to fulfil this need.

Room for improvement

A number of suggestions for improving the design were explained by interviewees. One theme which was prevalent throughout was the issue of safe and secure access to provide freedom of movement. This is pertinent to reduce risk which may arise from wandering. For those who wander at night, alarms and motion-activated lighting should be introduced. Benefits of outdoors space were discussed but it was felt that access was poor or non-existent. This was a missed opportunity for another space which has the potential to have a therapeutic effect for residents. Careful planning of these buildings should allow secure freedom of movement inside and out. It was recommended that entrances/exits should be concealed and dead-ends or locked doors should be avoided as these can be distressing.

Signage was mentioned as a means for improving wayfinding and in particular the use of relevant street names was considered a good idea. Other ideas on opting for under-floor heating as opposed to radiators were proposed as this would pose less of an obstacle and safer as the risk of burns would be reduced.

The feeling that some areas of the building were too small, particularly the resident's bedrooms/flatlets was felt to be unsatisfactory. This again reflected opinion from staff in these homes. Smaller sitting areas were said to be better as it encourages social interaction and reduce incidences of anxiety. There should be greater consideration of the visitor experience and how they feel when they enter the building (this should include making it easy for guests to enter and exit the building). In some cases, having people sitting around the entrance can be intimidating and this can discourage trips to see loved ones. In the situation of F5 the refurbishment altered the seating layout close to the main entrance to face inwards, focusing on the central area rather than the entrance door. This was described as improving this issue where a teenage grand-daughter felt that the inquisitive nature of some residents was off-putting. There was an emphasis on the need for homes to be more dementia specific rather than based on the general nursing care model to respond to the growing issue.

Location, location, location

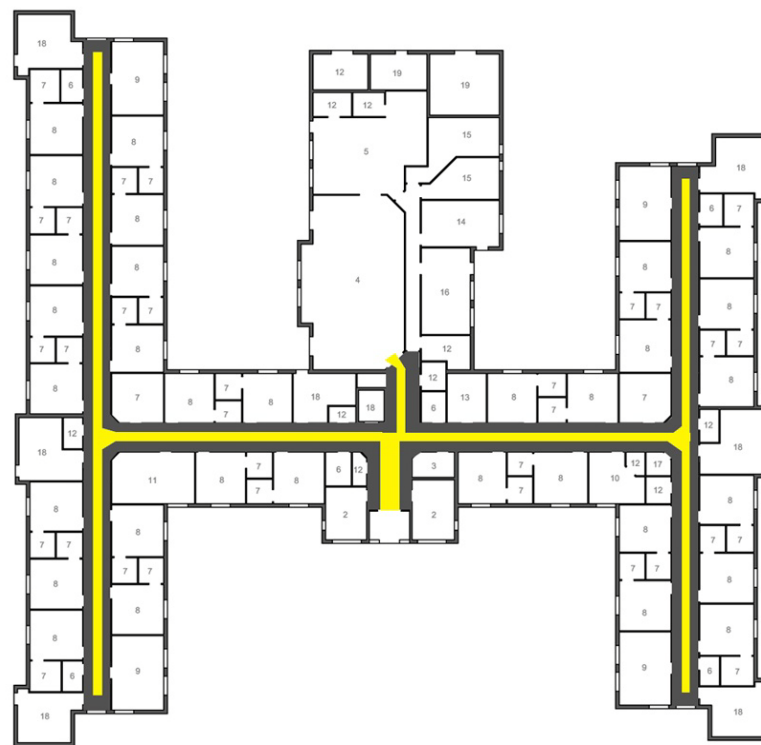
The importance of the issues of where these homes were located was discussed. Support services should be located near to the homes and be convenient for visitors to access. This should consider bus services, shops, local health centres, opticians, podiatrists and pharmacies. Another consideration was what sort of setting the potential resident is used to. Some may be more familiar with urban settings and other will prefer the countryside. F4 was described as having pleasant views as it was in a rural setting but was considered to be convenient to services. Corresponding with ideas proposed by staff, next of kin recognised the need for identifying a location where a good relationship may be established with the neighbouring community to enable integration.

The importance of good design

The opportunity to personalise the resident's bedroom or flat was regarded as important and reported for successful integration into the home. A few people spoke about how the resident's enjoyed furnishing their rooms with their own items and showed pride in it and liked to show people around. For some residents who could use a key for their room, this was considered important to provide privacy and reduce anxiety by preventing others from wandering into their room. Homeliness is enhanced by this and several interviewees mentioned that they feel secure and content in the nursing or residential home and like to get back to it after a day out (this is also linked to issues surrounding routine).

Interviews with Staff and Next of Kin

Smaller rooms were harder to personalise. This is in line with notions presented by staff who believed it was unacceptable for a person to move into a small room.



Key & Legend

- Effective width of corridor
- Obstacles (rest stops and furniture)

Figure 4-19: Long corridors in F3.

The implication of long corridors has meant that seating and rest stops have been installed (indicated in dark grey) which has reduced the effective width (indicated in yellow) of the corridors, creating obstacles.

With regards to layout, centralised, compact plans with a circuit which enables residents to walk around without getting lost along labyrinth corridors was considered to be best. In addition to this, open plan was explained as having the potential to be confusing and it was best to have separate spaces in order to clearly define their purpose. It was felt that a centralised plan could overcome some monitoring issues. It was also suggested that too many small living rooms should be avoided as they become unused and hard to supervise. Rooms and corridors should be spacious and en-suites were preferred as they were personal to the resident, making them more comfortable.

A suggestion by some interviewees was to make better use of the menus and orientation boards to include date and time. A next of kin linked to F5 described how the pleasant environment which was well decorated, created a desirable ambience and was influential in selecting a home for their mother. Others supported this by explaining that good design was essential, as they already felt guilty about moving their loved ones out of a domestic house they had been used to. Within this notion, they described how it was important that it would cater for all stages of care through creating a shared and inclusive environment and that it would be easy to find their way around.

“... the design for me was one of the reasons I wanted him to go there because it was easy... I think with dementia... if there's too much going on, it adds to the confusion... They can be over-stimulated... the decor is enough and his memory there from (names local street names used in F5)... they've got the pictures up and the little shops...visually it's very, very good and the lighting is very good as well, it's not too bright but it's not too dull either, because lighting as well can over-stimulate... space, light and colour are the main things...” (F5_P5_F1)

Access to garden space was often overlooked and was seen as a missed opportunity, especially on rural sites which had an expanse of land. As mentioned previously these are a vital ingredient in creating a natural environment and offer a place for activities and reminiscence. Lighting should be sufficient but not enough to over-stimulate and areas of glazing should be considered so glare does not become an issue (especially with eyesight problems). Other issues related to how door handles should afford the correct use so it is user-friendly. Seating options should provide a variety of social and private areas to enable monitoring whilst promoting independence.

4.4.4 Wayfinding

Ability or inability?

Wayfinding is a commonly recognised persistent problem which arises even in the early stages of dementia. Despite this, some of the resident's next of kin believed that some ability remained and that wayfinding does not seem to be an issue often because they have lived in the home for so long and are now familiar with their surroundings so it has become instinctive. It later transpired that the ability held may be to do with finding specific destinations, usually their own bedroom or a living room. Some people described their next of kin as previously being quite good at wayfinding and perhaps this has helped. Other people explained that they found it hard to know whether there was difficulty with wayfinding because it is hard to understand what is really being experienced as they find that this is not expressed

by their next of kin. Some improvement in wayfinding was reported after their next of kin had moved and settled into the home as the environment becomes more familiar. An anecdote regarding one resident in F5 stated that when they were taken on an outing and were returning back to the home they sometimes pointed out the nearby fire station as they knew it was time to turn into the road and they were almost home. A greater ability for residents to find their way seemed to be linked with homes which were considered to have a simple layout which had a limited amount of corridors and turns or decision points. Ultimately the inability to retain short term memories causes issues with wayfinding. In some cases, residents were thought to rely on others (including staff, visitors and other residents) to help them find their way around the home and this was used as part of their wayfinding strategy.

Routine

Next of kin described routine and familiarity as being an important factor related to wayfinding.

“I think routine and familiarity is important... it's good from the point of view that every corner... all ends up in the central area... So you can't really get lost... I think things like having their memory boxes and numbers on their doors is good... but she doesn't want anything like that, that identifies her at all... I think your own front door and they call it “flat,” naming it... and naming streets with local names is very good as well... I think it's from her number... There's times she gets up... and she doesn't go towards her room... she'll eventually find her way because she'll wander around...” (F5_P1_F1)

Maintaining routine was thought to reduce anxiety and reduce incidences of disorientation. There was also a tendency for residents to prefer certain rooms and chairs to sit in which should be respected as part of their routine. As mentioned earlier, in some cases residents who were taken out for the day, feelings of wanting to return to the home were expressed. Part of the concept of familiarity which was mentioned meant that the resident had become accustomed to using a certain route and therefore did not seem to get lost. However if they tried a new route or walked further in the building, this became problematic. For this reason it was anticipated that it was best to locate amenities conveniently in a zone within close proximity of the resident's bedroom. Some interviewees acknowledged that they have witnessed their next of kin get up to walk to their room and go in the wrong direction (this is usually corrected if someone is with them at the time but is likely to be a greater issue if they are alone). It was recognised that moving homes caused great disruption and confusion and it is best to avoid this once the person has settled as this can affect their ability to find their way.

Layout Issues

The layout of buildings was discussed comprehensively with regards to wayfinding. This was discussed in the positive sense where the layout in F5 made it an interesting journey on a circuit type plan with a central area as it has many visual clues and connections to other rooms. It was suggested that the layout should be simple with a centralised, compact plan which avoids dead-ends. The circuit plan also enables residents to find their way back to the start so the premise is that they will eventually find their way. In the case of F3 (H-shaped plan) some residents were reported to struggle with the T-junction as there was more than one decision point and in addition to this, mirroring of the plan seemed to cause confusion as residents would cross over to the “other side.”

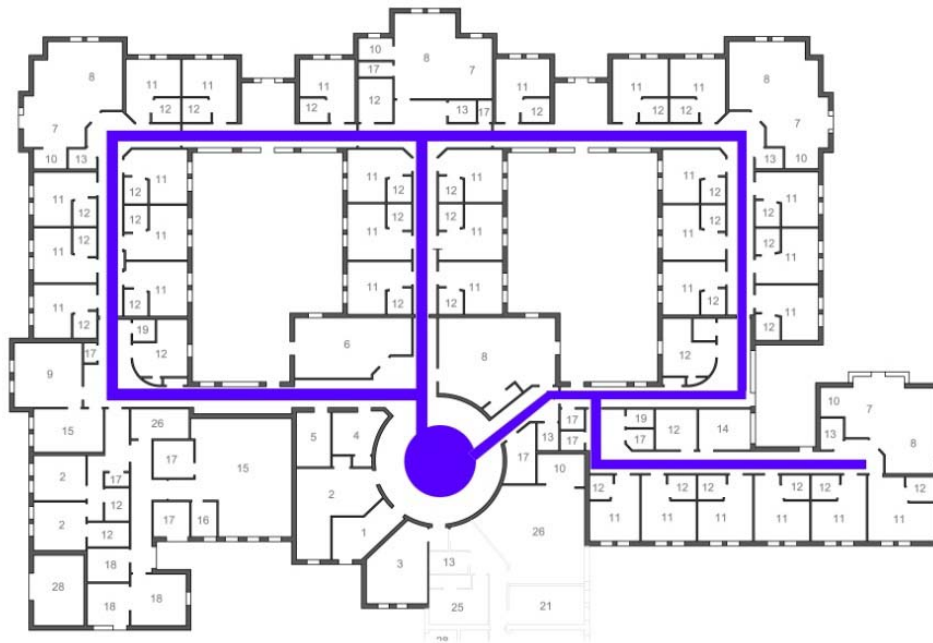


Figure 4-20: Circuit plan of F5.

Circuit type plans were preferred as they were believed to enable residents to eventually find their way or return to their original location.

“... every time daddy comes to the... crossroads... he’s never sure if it’s right or left, he knows it’s right but sometimes turning right can be a problem... if he goes left...then he’s lost... I think there’d need to be something...maybe it’s because it’s a mirror, because the night we thought he was missing, he was exactly three rooms down... they talked about painting it... like a bus stop and say... we live up this street’...” (F3_P1_F1)

In response to this, it was posited that environmental cues need to be utilised to provide assistance with wayfinding. This might be in the form of signage with local or familiar place names so the residents can relate to them.

Many interviewees reported that accommodation for people with dementia should be located on the ground floor and with level access to provide no physical obstacles and promote freedom of movement (and physical activity). Discussion about this related to previous homes, including their various family homes they lived in throughout their lives and whether this had an influence on how they felt about being upstairs.

“I’d rather the layout of being on one level... It’s more natural... she would have said ‘I think maybe we should go downstairs’... she must have had the notion of being upstairs, I don’t know whether that was from living in a bungalow... That’s my experience.” (F4_P1_F1)

From a practical point of view stairs pose a hazard, so it was considered best to conceal stairs or avoid them if possible. The same applies for lifts as they were deemed to cause confusion. It was hypothesised that there is a natural instinct to want to feel connected with the ground and in many cases, interviewees actually stated that this had been verbalised, for instance they said “I need to go downstairs to the kitchen.” Counter to this, a small minority who had been moved were wondering where their stairs had gone, although this was reported in cases where they had been moved from their own home to another domestic home, for instance, their daughter’s house.

Design and Environmental Cues

Sensory information was reported as an important wayfinding indicator. Visual cues were widely accepted as helpful. This encompassed signage, colours and views within the building and out of the building to garden spaces, which were all considered to make for a more memorable journey. There should be a variation in how spaces look as interviewees explained in previous settings, especially hospitals, everything looked the same and this was troublesome. Others discussed how distinctive features within these buildings can make places identifiable, for example shop fronts, hairdressers and the cafe which all can be used for activities as well. A wayfinding strategy described in cases where it was felt that the corridors looked the same was the use of the knowledge of the room number which enabled the residents to find their own room. In F5 it was described that the internal glazing provided residents the opportunity to see into rooms when walking around the building, which allows the function of the room to be seen and time can then be taken to make the connection if the person wants to go into the room. This also enables people extra time to work out who was in the room. Glazing throughout the building was recognised as a successful way of promoting freedom of movement

which should be coupled with concealing entrances and exits so residents feel they are not excluded from areas such as staff offices.



Figure 4-21: View of shop corridor in F5 which has an active cafe and hairdressers.

The areas of glazing provide glimpses to other places within the building and outdoor garden spaces. Additional wayfinding cues are provided by signage and how obvious the purpose of the area is.

A few people described how their next of kin was familiar with the kitchen and dining room area because of their love for food and were able to identify meal times and find their way due to the aroma present from the cooked meals. It was mentioned that sensory stimulus should be at the right level so it does not agitate individuals and thus cause disorientation.

“... he knows where his room is but I think one of the things that helped him was his key attached to him with the number on the key tag... it's all on one floor and it's on... a square, so even if he picks the wrong corridor, he will eventually find his room... if the basis of design is over-complicated then it's a no-no... I think visually they could see a lot... they've got lots of windows, the central area you can see from all the windows when you walk around the building... so is the outside area... he doesn't have to ask anybody... if he gets up and wanders he will always find something.” (F5_P5_F1)

Next of kin reiterated what staff posited regarding signage and its ability to facilitate wayfinding. Many recalled residents pointing out their room number or names on doors which they said they were able to identify their room by.

Room numbers in particular seemed to be significant in assisting residents and in the case of F5 this was on a street named after a local area. This was reported as a positive aspect and interviewees connected to homes without this expressed how it would be helpful but these should be relevant to the residents, ie. use local street names. Those who discussed the problem with the T-junction in F3 also placed emphasis on how signage would help those who got lost at this point and act as an environmental cue. In addition to text it was widely inferred that relevant images can aid in making a connection with what is behind a door. Identification of personal rooms was believed to go alongside furnishing the room with personal belongings that residents would recognise as their own. An interviewee from F5 determined that their father knew his room because he carries the key in his pocket with a key fob attached that has the number written on it.

Memory boxes were another form of room identification in F5 but these seemed to be less significant especially since some people explained they were not used or pointed out as much as the signage with the picture and text. Furthermore, in some cases (particularly those who exploit symptoms of confabulation) residents did not wish to be identified and preferred to keep their room private so they concluded it was important to respect their decision and rights.

“... definitely having their names on their door... and her number with her flat on it...she would recognise that... I don't know if mummy mentioned the colour scheme... but I think when she does come around and the carpet is sort of the greeny colour she'll say 'oh I know where I am now'... because my mummy walks with her walking aid she's sort of bent over a bit and she's probably in the position that she would notice it.” (F5_P3_F1)

Colour schemes were mentioned as helping to indicate different areas or highlight purposes of the room, for instance bathrooms may all be the same colour. One feature of particular interest was the floor in F5 where the refurbishment changed the colour of carpets in different areas within the building. Staff recognised that the effect of this is still to be known but it was reported that some residents who walked with walking aids and look down at their feet knew they were close to their bedroom as the carpet had changed colour to green.

Interviews with Staff and Next of Kin

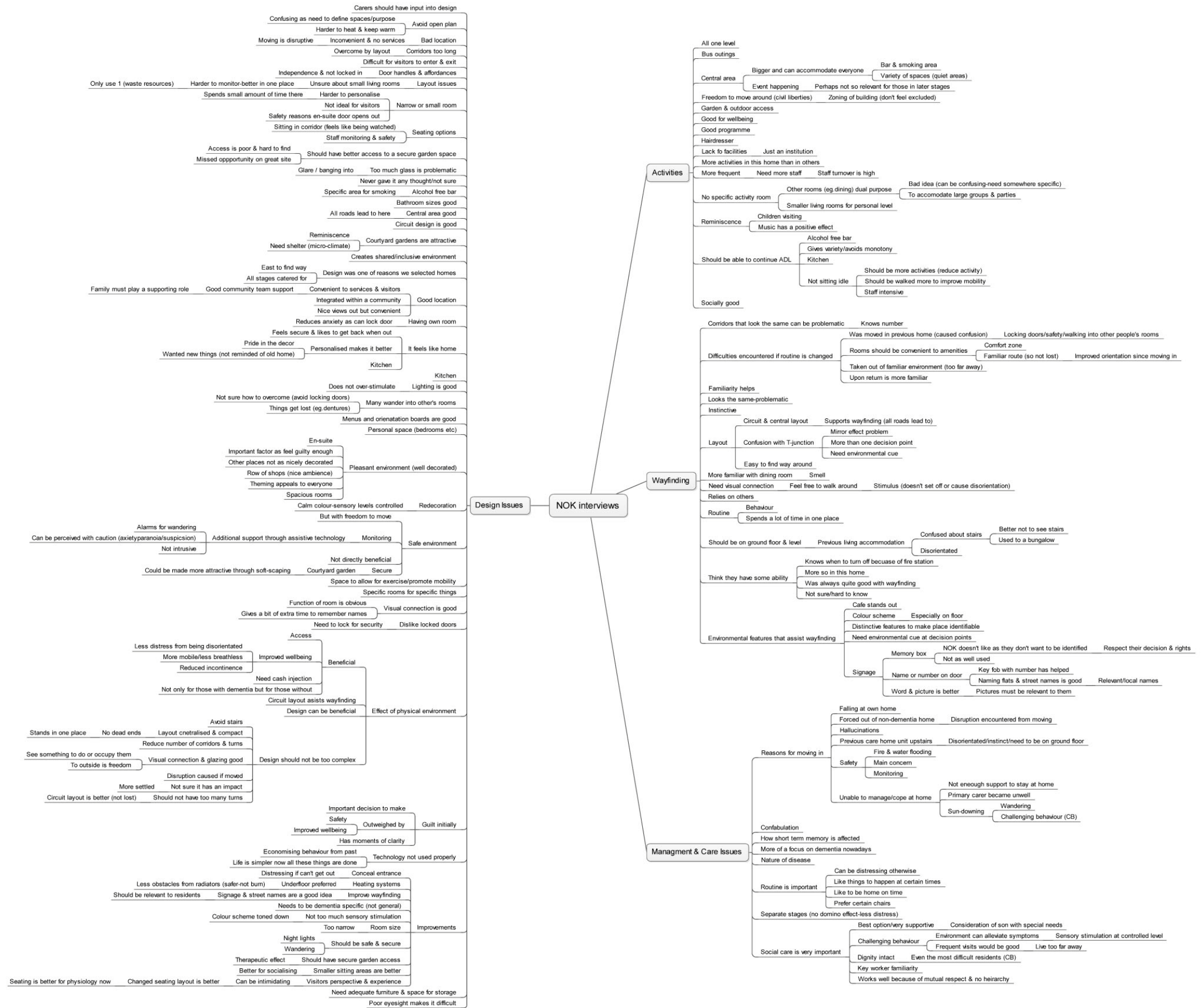


Figure 4-22: Cognitive map showing a summary of the themes and codes which emerged from the next of kin interviews.

4.5 Summary of findings

There were many parallels between staff and next of kin responses, showing concurrence and adding supplementary detail which provides a better understanding of the issues. The importance of the physical environment for people with dementia was emphasised throughout. The manager from F5 succinctly described this by stating the following:

“I think the physical environment can stimulate, can provide occupation, can provide a sense of value, a sense of self-worth for the individual, it can make them feel useful and provide them with the ability to contribute... so I do think that we can't underestimate the value of design.” (F5_M1)

Table 4-1: A tabulated summary of the findings which materialised from interviews.

Response	Staff interviewees	Next of kin interviewees
	Both staff & NOK interviewees	
Activities	<ul style="list-style-type: none"> • Inclusion in activities • Consider at design stage 	<ul style="list-style-type: none"> • Benefits from activities: even if unable to remember (not idle) • Need better facilities (avoid dual purpose as it can be confusing) • Best on ground floor (access & mobility, stairs & lift can be confusing)
	<ul style="list-style-type: none"> • Larger central area with adjacent smaller spaces to satisfy needs (for 1:1 and group activities-provide inclusion) • Outdoor spaces often overlooked (access, shelter, shade & lighting) 	
Management & care issues	<ul style="list-style-type: none"> • Design should be supportive of care • Changing needs (space standards, accommodating couples, facilities, shift to dementia care from general nursing) • Continuity of staff 	<ul style="list-style-type: none"> • Reasons for moving in (mostly based on support & monitoring)
	<ul style="list-style-type: none"> • Culture shock (guilt associated with moving/settling loved one in) • Use of life stories to inform care • Monitoring issues (staff ratio, safe, secure environment, small & compact layout) • Person-centred care • Routine is important 	

Interviews with Staff and Next of Kin

Responses	Staff interviewees	Next of kin interviewees
	Both staff & NOK interviewees	
Design issues	<ul style="list-style-type: none"> • Not dementia specific (re-categorised/cognitive issues overlooked) • Future proof (predict for future expectations) • Refurbishment (upgrade & experimentation) • Flooring materials (mobilisation-avoid stairs) • Views within and out of building (make purpose of building easy to identify) • Corridors should not be too long or narrow • Compact, centralised, simple plan (smaller no) • Light (natural-circadian rhythm, glare, visual impairment) • Zone dependencies (cater for greatest cognitive function) • Personalisation (homeliness-room size) 	<ul style="list-style-type: none"> • Sensory stimulation at a controlled level • Under-floor heating • Encourage visitors (convenient & welcoming) • Not open plan (need clear defined spaces) • Affordances (eg. door handles should be easy to use) • Variety of seating options (1:1 or group) • Freedom of movement (no locked doors/off limits)
	<ul style="list-style-type: none"> • Lack of staff/carer input • Gardens overlooked • Community support & services (integration) • Potential environmental cues (wayfinding) • Moving person is disruptive & causes disorientation (legislation should be supportive) • Design for dementia is good for all (impact of physical environment) 	
Wayfinding	<ul style="list-style-type: none"> • Simple routes • Reduce turns/decisions • Contrast walls, floors & handrails (tone) 	<ul style="list-style-type: none"> • Instinctive (once settled in & familiar) • Routine reduces anxiety (orientation improved through familiar routes & rooms) • Stairs & lifts cause confusion
	<ul style="list-style-type: none"> • Reliance on others • Signage (relevant names, address, text & image, bold colours) • Layout (simple, centralised, compact [circuit is good]-avoid symmetry/mirroring, junctions, locked doors) • Colour code areas (carpet colour to indicate zones) • Sensory cues (visual, aroma) • Memory boxes (not as successful-privacy issues) 	

Figure 4-15, p.116 and Figure 4-22, p.132 present cognitive maps which summarise findings from staff and next of kin interviews by linking codes to themes. Some of the listed findings already exist within the realm of knowledge and add to current knowledge and others are new points for consideration. The implications of these findings are discussed in Section 4.6.

4.6 Summary

Emerging findings from the interviews will be used in conjunction with findings from the wayfinding walks to synthesise which features of the physical environment may be conducive for wayfinding. It was felt that design did not holistically consider issues regarding dementia from the outset. Predicting how the building will operate and evolve to meet future needs and expectations is necessary.

The design should be supportive of care and activities. The layout and arrangement of the building has a direct impact on monitoring in providing a safe, secure environment which is free from barriers, dead-ends and locked doors. It was therefore determined that a simple, compact, centralised plan was best suited as this would ultimately reduce corridor length and the number of decision points or turns. The circuit type plan was mentioned several times as a successful building typology for residents with dementia. Issues with wayfinding were reported to be due to junctions (decision points) and symmetry (or mirroring) in the plan which can cause greater confusion.

Adequate lighting has a role to play regarding circadian rhythm (natural light), controlling glare and providing sufficient illumination to address those with visual impairment. Bedroom/flatlet sizes should be large enough to allow for personalisation to create a homely feel and make them more identifiable to the resident. In some of the older homes, residents' rooms were often criticised for being too small. Views within and out of these buildings were considered to provide glimpses to other areas of the building. This was made possible through the use of internal glazing and it was suggested that if the room's purpose is obvious through the furnishings, decoration or activity, then it can make places easier to identify and assist with wayfinding. Various features were named as potential environmental cues which may be used for wayfinding but signage in particular stood out. Signage in homes is best to incorporate relevant or local areas so the residents may have an address. It should include picture and text with bold colours to make it easier to make the connection and understand what these mean. Many of the residents were considered to know which number their room was and this was used to find their way.

Refurbishments provide the opportunity to compare or re-evaluate and most homes explained the changes were made to improve lighting, tonal difference and colour selection. In F5 the management staff decided to renew the carpet and in doing so they placed different colours in different zones (this did not have a large tonal difference but was a recognisably different hue). In this same home a next of kin described how their mother knew they had returned to their vicinity of the building because the carpet was now green. There was some debate as to whether she noticed this because she walked with a walking aid so her field of vision would probably be lower; although it is widely accepted that people with dementia tend to look at their feet anyway as they walk (Cohen and Weisman, 1991; Burton and Mitchell, 2006).

Chapter 5 presents the wayfinding tasks and the briefing and debriefing sessions conducted with people with dementia. This was an opportunity to actively engage with participants with dementia, eliciting their experiences and responses of the physical environment.

Chapter 5: Wayfinding Walks

5.1 Introduction

This chapter is structured to firstly examine the ability of the people with dementia over the three monitored walks. These were conducted to examine if there was potential for learning during walk one (W1), capability for retaining short-term memory for walk two (W2) and longer term memory during walk three (W3). Further details of these walks are in Section 5.1.2.

The aim of this was to explore how the architectural layout and design of the building affects wayfinding ability of those with dementia. The observed walks were recorded and this data was analysed and included conversation, behaviour, images seen during the wayfinding tasks and fluctuation in speed throughout. Space Syntax was also used as a quantitative method to analyse the architectural composition and layout and predict how this may influence and affect movement and wayfinding.

This chapter is structured in a manner which initially examines each of the four fieldwork sites in terms of the wayfinding performance of the participants with dementia across the three walks. The latter part of this chapter is again structured around the fieldwork sites and focuses on the findings from the observed walks. This illustrates wayfinding issues, allowing for the synthesis of potential environmental causes, based on the various layers of data obtained from the observations and the feedback received from residents who participated in the wayfinding walks.

5.1.1 Action capability test: 10m walk test

An action capability test was conducted in order to determine each individual's average walking speed. The intention of this was so the results from the walks could be normalised and compared, both in terms of personal performance and with other participants. This involved asking participants to walk a 10 metre straight path and measuring the time taken to do this. This task was repeated three times to establish their average cadence. A normal line (indicating average walking speed) was plotted on the graphs. This could then be used as a reference point to determine whether performance on the walks was above or below average speed for a particular individual (see Figure 5-2 as an example).

5.1.2 Repeated measures design: three walks

The research design included a repeated measures design to study the effect of the participant's performance over time. Three walks were planned on two different days to enable this observation. The first two walks were conducted on the first day, with W1 led by the researcher and W2 led by the participant. W3 was conducted one week later and led by the participant (as per Table 5-1). All walks followed the same route and were designed to include familiar start points and destinations to the participants. Details of these walks are as follows:

	Led by	When conducted	Purpose/what is being tested
Walk one (W1)	Researcher	Day 1	Primary memory (opportunity for learning)
Walk two (W2)	Participant	Day 1 (following a break after W1)	Short-term memory (recency)
Walk three (W3)	Participant	Day 2 (one week from W1 & W2)	Long term memory

Table 5-1: A tabulated summary of the findings which materialised from interviews.

The significance of the return journey

Spectral graphs created by Space Syntax analysis using VGA and avatar based analysis are identical for both directions of the route (Figure 5-1). This is because they share the same physical properties including distance. However, the reality of spatial experience means that the perception and perspective changes in the different direction so the outbound and return journeys present an alternative view of the physical environment. Outbound and return journeys of the walks were therefore recorded to check patterns in both directions to compensate for the fact the Space Syntax methodologies are not fully immersive.

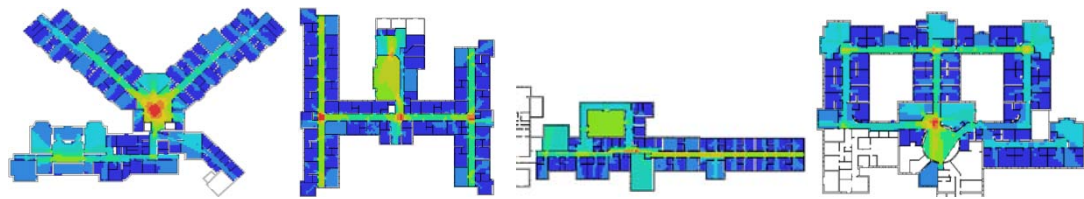


Figure 5-1: VGA spectral graph is the same for both the outbound and return directions of the walks.

Left to right: VGA spectral graphs for F2, F3, F4 and F5.

Section 5.2 will now present findings from the three wayfinding tasks, by firstly examining those in the four individual fieldwork sites. These were then compared to look for patterns and to investigate how the capacity for wayfinding in those with dementia is affected over time, across the three walks.

Wayfinding Walks

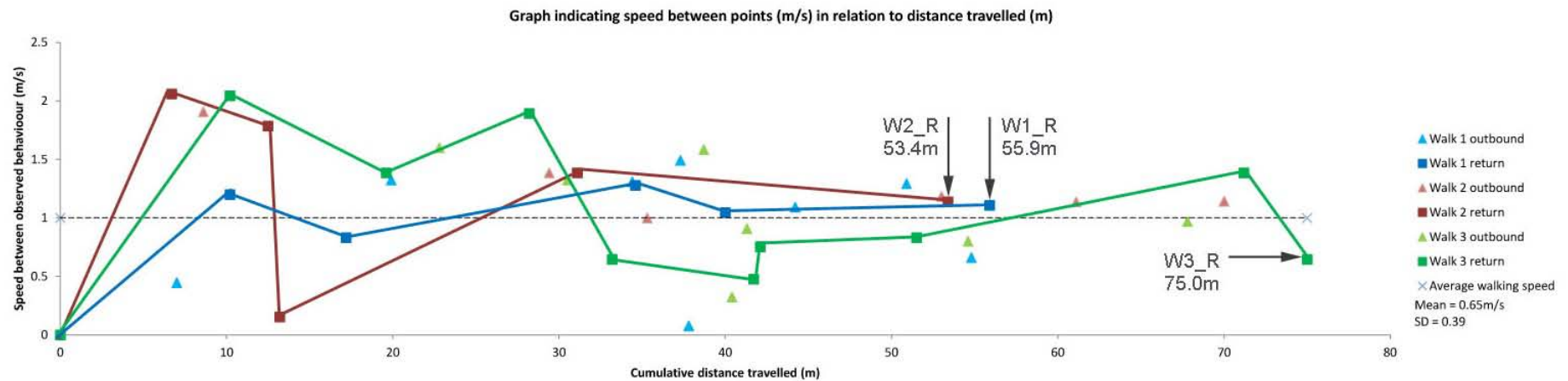


Figure 5-2: Graph showing the return walks of F3_P4.

There is a steady cadence during walk one but this experiences dips in speed during walks two and three with acceleration and a more stable rate restored upon approach to the destination.

5.2 Comparison of the three walks

It was hypothesised that performance over the walks would improve due to learning and retention of memory after repeating the task, although it was important to consider what effect dementia had on this. Before identifying features of the physical environment which caused issues or supported wayfinding, it is important to establish and discuss patterns which emerged from the three walks. This was done by examining the data which was presented in the form of graphs (for full analysis sheets please see Appendix 3).

5.2.1 Patterns and differences across the three walks



Results from fieldwork site two (F2):

- Generally W1 is the shortest and fastest route making it the most efficient. Pauses and prompts increase for F2_P2 (from 0 on W1 to 2 on W2 and 4 on W3), F2_P3 (from 6 on W1 to 7 on W2 to 6 on W3) and F2_P4 (from 1 on W1 to 10 on W2 to 11 on W3) across the three walks as their speed decreases (Table 5-2, p.145).
- W1 usually plateaus and varies around the average speed. With the exception of F2_P2_W1 whose speed increased throughout (creating a positive correlation). F2_P2's speed reduced greatly across the walks (average speed recorded as 0.70m/s for the 10m walk test) as they walked at a pace of 0.70m/s for W1, 0.41m/s for W2 and 0.43m/s for W3 (Table 5-2).
- Performance is poorer on W3, with speeds below average, except in the case of F2_P1_W3 who shows an improvement on W2 (which had a large fluctuation). F2_P1 expressed that they felt tired during W2 which links into the description that their mobility is poor, however they maintained speeds consistently close to their average as determined by the action capability test which was 0.32m/s (0.35m/s on W1, 0.29m/s on W2 and 0.35m/s on W3). It should also be noted that F2_P1's MMSE indicates a mild stage of dementia which may have resulted in them maintaining a steadier performance on the wayfinding tasks as compared with the other participants (see Table 5-2).
- Although F2_P4 shows a similar initial acceleration during W1 and W3, their performance on W3 is relatively poor with many of the recorded speeds reduced and below average (see Table 5-2). F2_P4 travels greater distances on W3, 98.1m on the outbound journey and 166.4m on the return. This required a longer time, which significantly reduced speeds to 0.44m/s and 0.34m/s on outbound and return journeys respectively (Figure 5-3).

Wayfinding Walks

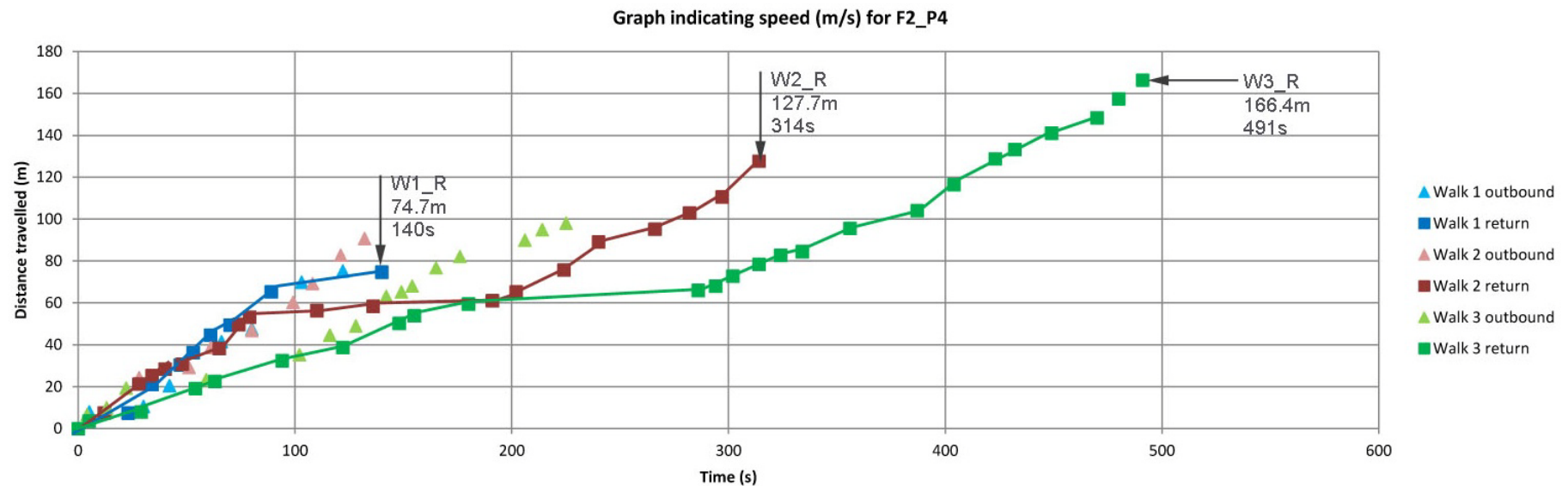


Figure 5-3: Graph indicating speed for the return walks for F2_P4.

This shows a reduced performance as the walks go on (a common theme for many of the participants).

Walk three is the least efficient as it covers a longer distance due to wayfinding errors and takes a longer period of time.



Results from fieldwork site three (F3):

- Similarly, W3 is the least efficient and is usually the slowest and longest. Anomalies occurred in the instance of F3_P2 on their first walk (W1) and F3_P4 on the outbound journey of their first walk (F3_P4_W1_O).
- Explanations for this may relate to F3_P2_W1 having a slightly longer distance to cover (57.0m as opposed to 47.0m on W2 and 43.3m on W3, see Table 5-3, p.145).
- F3_P4_W2_O also became disorientated and walking off in the wrong direction at the T-junction which caused them to pause and required prompting and correcting by the researcher. This therefore increased the distance to 70.0m versus the route length of around 55.0m, despite their overall average speed for this walk being high at 0.72m/s which was above their recorded speed for the action capability test (0.65m/s).
- F3_P4_W3_O was particularly fast (0.81m/s above their average of 0.65m/s) but the participant presented with challenging behaviour and appeared agitated. On the return walk (F3_P4_W3_R) they had their slowest and relatively long distance walk (lasting 111s and travelling a distance of 75.0m) as they became fixated with wanting out at the main entrance door (visible from the route walked). Again the average speed is 0.68m/s higher than their action capability (0.65m/s), however the speed is erratic with many pauses and stopping throughout. Further detail about fluctuating speeds of the return walks of F3_P4 can be seen in Figure 5-2, p.145.
- F3_P4 had a slightly different walking rhythm to other participants as they had an initial acceleration, which then slowed in the middle and returned to an average pace towards the destination. This can be explained by the erratic nature of their walking speed which is usually very fast with pauses. This can be seen in Table 5-3 where all walks except F3_W1_O have speeds above the average obtained from the action capability test (0.65m/s). Whereas other residents fluctuated around their average speed.



Results from fieldwork site four (F4):

- Despite only being able to successfully recruit one participant from F4, similar patterns have emerged. Performance is reduced over time, with the slowest times occurring on W2_O and W3_R. During these a greater reliance on the researcher is recorded within the conversation. W1 is the fastest even though it covers a longer distance.
- F4_W1_R is fastest even though it is a longer distance (97.2m, lasting 172s with an average speed of 0.57m/s). The average speed determined by the action capability test for F4_P1 was 0.30m/s.
- Slowest speeds of 0.22m/s and 0.21m/s were recorded on F4_P1_W2_O and F4_P1_W3_R respectively (see Table 5-4, p.145). This was indicative of a reduced performance on walks two and three (W2 and W3).



Results from fieldwork site five (F5):

- There is an evident deterioration in performance in walks two and three for most participants (Table 5-5, p.145).
- Inconsistencies were seen with F5_P5 who showed improvement on W2 with a speed of 0.38m/s on the outbound journey, an increase on the action capability average of 0.35m/s. This irregularity may be explained as F5 was focused on the task during the second walk as they were given the instruction to lead and during W1 they were distracted and wanted to show the researcher their flatlet.
- Other anomalies were with those who showed improvement on W3, including F5_P1 and P4. During F5_P1_W3 fewer prompts (four) were required and the speed was above the average of 0.28m/s on the outbound journey (0.31m/s) and close to it on the return journey (0.27m/s). In contrast to this F5_P1 experienced their worst performance on W2 which had an average speed of 0.25m/s, this may be linked to them feeling tired or exerted on the second walk of the day (Figure 5-4). The best performance was seen on W3 for F5_P4 who recorded an average of 0.85m/s on their return journey (their average was 0.64m/s).
- F5 and F2 were classed as residential homes therefore medical problems may have been less severe than in F3 and F4 (nursing homes). Demographic information was recorded and indicates that the participants from each of the homes had various stages of dementia which would affect their cognitive ability and performance during the wayfinding tasks (Table 3-6, p.77).

Wayfinding Walks

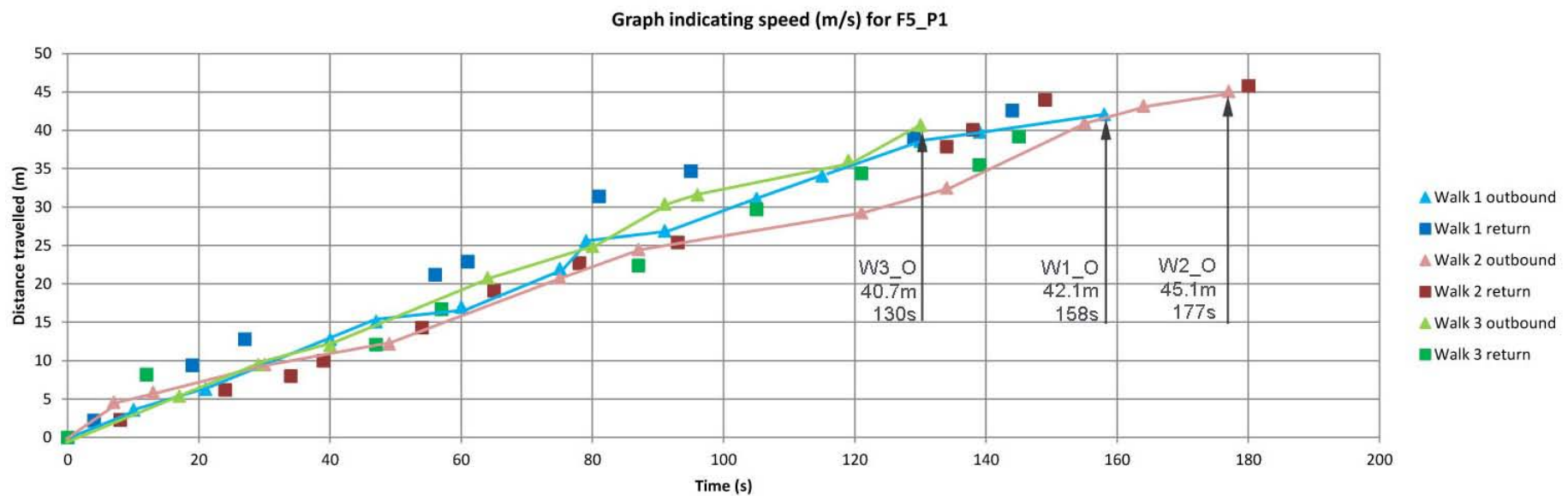


Figure 5-4: Outbound journey of F5_P1 walks.

Anomalies are shown where the performance on walk two is the poorest and there is improvement shown on walk three which may indicate exhaustion and/or learning.

Wayfinding Walks

F2	Distance (m)						Time (s)						Average Speed (m/s)						Number of Prompts/Pauses						Demographics				
	W1		W2		W3		W1		W2		W3		W1		W2		W3		W1		W2		W3		Age	Gender	Dementia	Stage (MMSE)	Action Capability 10m walk test (m/s)
	O	R	O	R	O	R	O	R	O	R	O	R	O	R	O	R	O	R	O	R	O	R	O	R					
P1	31.0		31.0		31.0		88		106		88		0.35		0.29		0.35		0		1		0		85	F	Age related	Mild (20-25)	0.32
P2	31.0		31.0		35.5		44		76		82		0.70		0.41		0.43		0		2		4		87	F	Age related	Mild-moderate (1-22)	0.70
P3	21.8	20.6	21.3	21.3	22.7	24.3	69	183	122	65	113	165	0.32	0.11	0.17	0.32	0.20	0.15	3	3	5	2	2	4	89	F	Alzheimer's	Moderate-severe (7-12)	0.21
P4	75.3	74.7	90.7	127.7	98.1	166.4	122	140	132	314	225	491	0.61	0.53	0.69	0.41	0.44	0.34	1	0	4	6	4	7	99	F	Age related	Moderate-severe (7-12)	0.59
Mean	39.8	47.7	43.5	74.5	46.8	95.4	80.8	161.5	109.0	189.5	127.0	328.0	0.50	0.32	0.39	0.37	0.36	0.25	1	2	3	4	3	6	90				0.46
St. Devn	24.1	38.3	31.8	75.2	34.6	100.5	32.9	30.4	24.5	176.1	66.7	230.5	0.19	0.30	0.22	0.06	0.11	0.13	1	2	2	3	2	2	6.22				0.23

Table 5-2: Quantitative data from the walks conducted in F2.

F3	Distance (m)						Time (s)						Average Speed (m/s)						Number of Prompts/Pauses						Demographics				
	W1		W2		W3		W1		W2		W3		W1		W2		W3		W1		W2		W3		Age	Gender	Dementia	Stage (MMSE)	Action Capability 10m walk test (m/s)
	O	R	O	R	O	R	O	R	O	R	O	R	O	R	O	R	O	R	O	R	O	R	O	R					
P1	60.9	46.3	48.0	51.5	63.2	65.7	145	111	116	112	152	148	0.42	0.42	0.41	0.46	0.42	0.44	3	1	2	1	1	2	79	M	Vascular	Moderate (14)	0.42
P2	57.1	67.6	47.0	48.1	45.3	46.1	132	182	62	61	106	82	0.43	0.37	0.76	0.79	0.43	0.56	2	3	3	2	2	1	89	F	Vascular	Late (6)	0.38
P3	55.7	54.4	54.0	54.3	63.3	54.4	100	97	58	57	190	116	0.56	0.56	0.93	0.95	0.33	0.47	1	1	1	2	3	2	82	F	Alzheimer's	Moderate (15)	0.56
P4	54.8	55.9	70.0	53.4	67.8	75.0	95	77	97	67	84	111	0.58	0.73	0.72	0.80	0.81	0.68	1	1	3	1	1	3	73	M	Korsakoff's	Moderate-late (7)	0.65
Mean	57.1	56.1	54.8	51.8	59.9	60.3	118.0	116.8	83.3	74.3	133.0	114.3	0.50	0.52	0.71	0.75	0.50	0.54	2	2	2	2	2	2	80.8				0.50
St. Devn	2.7	8.8	10.6	2.7	10.0	12.7	24.3	45.7	28.0	25.5	47.4	27.0	0.08	0.16	0.22	0.21	0.21	0.11	1	1	1	1	1	1	6.65				0.13

Table 5-3: Quantitative data from the walks conducted in F3.

F4	Distance (m)						Time (s)						Average Speed (m/s)						Number of Prompts/Pauses						Demographics				
	W1		W2		W3		W1		W2		W3		W1		W2		W3		W1		W2		W3		Age	Gender	Dementia	Stage (MMSE)	Action Capability 10m walk test (m/s)
	O	R	O	R	O	R	O	R	O	R	O	R	O	R	O	R	O	R	O	R	O	R	O	R					
P1	65.1	97.2	83.4	89.9	67.0	52.3	242	172	373	334	262	251	0.27	0.57	0.22	0.27	0.26	0.21	3	3	1	2	3	3	84	F	Vascular/Alzheimer's	Moderate-late (6)	0.30
Mean						75.8					272.3						0.30					3							
St. Devn						17.1					71.4						0.13					1							

Table 5-4: Quantitative data from the walks conducted in F4.

F5	Distance (m)						Time (s)						Average Speed (m/s)						Number of Prompts/Pauses						Demographics				
	W1		W2		W3		W1		W2		W3		W1		W2		W3		W1		W2		W3		Age	Gender	Dementia	Stage (MMSE)	Action Capability 10m walk test (m/s)
	O	R	O	R	O	R	O	R	O	R	O	R	O	R	O	R	O	R	O	R	O	R	O	R					
P1	42.1	42.6	45.1	45.8	40.7	39.2	158	144	177	180	130	145	0.27	0.30	0.25	0.25	0.31	0.27	3	2	3	2	2	2	74	F	Alzheimer's	Mild-moderate (19)	0.28
P2	41.0	42.4	41.9	43.2	38.6	40.2	131	128	162	183	152	189	0.31	0.33	0.32	0.24	0.25	0.21	1	1	2	3	2	3	71	F	Vascular	Mild-moderate (20)	0.32
P3	45.0	43.5			225	221							0.20	0.20					3	3					89	F	Alzheimer's	Moderate (14)	0.19
P4	60.9	61.4	62.0	60.8	58.0	63.4	89	102	103	103	95	75	0.68	0.60	0.70	0.59	0.61	0.85	0	1	0	1	0	1	80	F	Age related	Mild-moderate (20)	0.64
P5	43.1	39.9	43.1	43.6			165	149	113	156			0.26	0.27	0.38	0.28			2	3	1	2			83	M	Vascular	Moderate-late (13)	0.35
Mean	46.4	46.0	48.0	48.4	45.8	47.6	153.6	148.8	138.8	155.5	125.7	136.3	0.34	0.34	0.41	0.34	0.39	0.44	2	2	2	2	1	2	79.4				0.36
St. Devn	8.2	8.7	9.4	8.4	10.6	13.7	49.8	44.3	36.3	37.0	28.7	57.5	0.19	0.15	0.20	0.17	0.19	0.35	1	1	1	1	1	1	7.16				0.17

Table 5-5: Quantitative data from the walks conducted in F5.

5.2.2 Summary of findings from the three walks

Results from the various walks in the different homes indicate that wayfinding ability is hindered after W1. This is especially true during W3 (conducted one week later) where speeds are usually below average. Participants' performance is usually poor on W2 when compared with W1, however irregularities are seen in F3_P1_W2, F3_P2_W2, F3_P3_W2 and F5_P5_W2 where there is improvement on W2 (see Table 5-3 and 5-5 respectively).

Reasons behind this may be linked to short-term retention or learning, following instructions and focusing on the given task. In most cases an initial spike in speed is seen (which could be linked to focusing on the task), followed by speeds which plateau and are maintained above average after this. Other anomalies include that a minority (F2_P1_W3 and F5_P1_W3) show improvement in W3 where performance was observed to be more efficient by becoming shorter in time and distance. In both these cases (F2_P1_W3 and F5_P1_W3) it is likely they experienced exertion during W2 (this was conducted on the same day as W1) as they have medical conditions which can affect their mobility such as chronic obstructive pulmonary disease (COPD).

Generally, however there appears to be a progressive reduced ability shown as the number of walks increases, where W2 is worse than W1 and W3 is worse than W2. In the fieldwork sites which are classified as residential homes (as opposed to nursing care), there seems to be a greater capacity to retain memory and learn from the previous walks and performance is sometimes not greatly reduced on W3. Comparing the three walks across the different fieldwork sites reveals some information on how dementia inhibits the ability to retain knowledge of routes as results show impaired performance during walks two and three. This does not reveal design considerations which may influence wayfinding ability, therefore it is necessary to delve deeper into the results in order to understand which environmental features may assist wayfinding. This will be examined in the next section where data from the walks (including Vicon images, conversation, distance, time, speed and route travelled) will be utilised in the synthesis of the findings.

5.3 Analysis and synthesis of the wayfinding walks

This section of the chapter explores issues which emerged during the wayfinding walks and debriefing. Demographic data from the participants at each of the homes was collected, this included: age, gender, length of residency, details about their dementia (type, stage, MMSE, date of diagnosis), action capability for the 10m walk test and any other conditions which may affect their ability during the walking tasks (see Table 3-6, p.77). Individual differences were taken into account during the analysis as it was acknowledged that this might affect wayfinding performance on walks.

Data collected from the wayfinding walk tasks included: distance travelled, time, speed, point on plan, conversation during the walk, behaviour during the walk, visual data from the Vicon Revue Lanyard camera and debriefing. A spectrum was manually created based on the speeds of the walk which could be compared to the Space Syntax data (VGA and avatar analysis). Data from the action capability 10m walk test was used to obtain an average walking speed (indicated using green) and the range of walking speeds throughout the wayfinding tasks would be used as lower (blue) and upper speed limits (red) to correspond with the Space Syntax spectrum colours (Figure 5-5). A spectra was therefore devised for each individual and was specific to their own personal performance, this was indicated on the key of the A3 analysis sheets (see Figure 3-4, Chapter 3, p.90).



Figure 5-5: Movement spectrum indicating speed in m/s for F5_P1.

A movement spectrum was devised for each participant of the wayfinding walks with the minimum recorded speed indicated in blue, average (action capability test) in green and the maximum speed in red which was designed to correspond with Space Syntax.

All data was collated onto a large matrix in Microsoft Excel to allow for comparisons across all available (see example in Table 5-7). Problem areas and potential features of the physical environment which may assist with wayfinding were identified. Patterns were then highlighted and individual cause and effect diagrams were drawn for each of the participants. Data for each of the fieldwork sites were then drawn on separate cause and effect diagrams to present issues relating to each specific home. These will now be discussed with reference to each of the homes, giving specific examples involving participants.

Wayfinding Walks



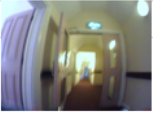





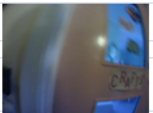
Point on plan	Conversation	Behavioural effect	Graph	Alert!	Map	Image
1	P4: I better take my rollator. I could do without it rightily but I'm not allowed. R: Right ok. P4: They'll say where's your trolley? They all have different names for it.	P4 & R commence walk.				
2	P4: And you want me to lead you to the parlour? R: That's right P4 so down to the parlour.	P4 & R turn left out of room.		Acceleration		
3	P4: And that's just a store. R: Oh right...yeah.	P4 walks looking straight ahead and points looking at store on RHS.		Acceleration		
4	P4: And this is our crafts room...we do different things. R: Uh huh. P4: I'm sure it's closed...but anyway. It had been a dining room at one time. We used to have small dining rooms. R: Oh right.	P4 looks straight ahead and walks to craft room and pauses.		Deceleration		

Table 5-6: A segment from the outbound journey from the F2_P4_W2 analysis matrix.

This shows features which are prevalent in many of the walks. This includes initial acceleration from setting out on the walk (point two), acceleration on straight corridors (point three) and natural deceleration in response to a negotiating obstacles, in this case, a corner at point four.

Some common points for consideration:

A regular feature of the walks was an expected initial acceleration when setting out and deceleration when faced with obstacles such as doors or corners due to the need to negotiate these. A reduction in speed was also accepted when the participant was giving way to someone else who was walking in the area, particularly narrower corridors. In many cases, lengths of straight corridors promoted acceleration. This may be due to the lack of features which might act as distractions or the homogeneity where there were repetitive, identical doors along the way. This may serve as a disadvantage where a resident's bedroom is along one of these straight corridors as it can be easy to overlook wayfinding cues if it looks the same.

Wayfinding Walks

Distance (m)	Time (s)	Speed b/w points (m/s)	Colour	Point on plan	Conversation	Behavioural effect	Graph	Alert?	Map	Image	VGA	Avatar	Environmental features	Synthesis (probable cause)
Outbound														
0	0		Blue		1 R: So P4 I'd like you to walk to the parlour with me today. X's room. P4: The fancy room down the corridor or the other one? R: That's right the one down the corridor with all the nice furniture in it. P4: Oh aye the fancy one...well you keep me right. R: Yes ok.	P4 & R commence walk.								
8	May:16	1.6	Red		2 P4: And did you see I have a wee bathroom too. It's not very big but it's good and handy. R: Well it's lovely to have it so handy. P4: Yeah it's great. R: Yeah it's great. P4: It's alright it's not beautiful but it's there and it's mine and nobody else is using it. P4: Yes. It's very good to have. P4: Oh yes.	P4 opens door of bathroom & shows it to R. There is a pause to chat about the bathroom.		Acceleration					Bedroom door	/ Initial. After clarification parlour is the "fancy room." Pause at en-suite to show R. Contabulation?
10.6	30	0.1	Blue-green		3	P4 commences walking again.		Deceleration					Corridor outside bedroom	
20.5	42	0.83	Yellow-orange		4 P4: You see the floor dips down here...I know this off by heart. R: So you know when the ramps are coming? P4: Aye (laughs)...I don't even notice it.	P4 comments on the ramps on the floor.		Acceleration					Straight corridor to corner	\ Turns onto corridor (slowed from pause at en-suite) / ! Straight corridor (commenting on ramps)
29.2	51	0.97	Orange-yellow		5 R: So we're just going down to X's room then.	P4 & R continue to walk. TV is audible from common area.								
41.5	66	0.82	Yellow-orange		6	P4 & R turn corner.		Deceleration					Central seated area: turning corner. TV noise.	\ ! Central area (P4 asks what they have to do)
47.6	80	0.44	Yellow-green		7 P4: What do I have to do? R: We're just walking down to the parlour here P4 ok? P4: Aye.							Corridor to parlour door	/ ! Straight corridor	
69.9	103	0.97	Orange-yellow		8 P4: You see the wee room in there? R: Yeah that's the other dining room. This is us here in the parlour. P4: Oh it's all set up for tomorrow's party.	P4 & R turn to go into parlour.		Acceleration					Destination: parlour	/ Arrived at parlour. Content.
75.3	122	0.28	Green-yellow		9 R: Oh it's lovely. P4: Isn't that nice...Isn't she a great girl. R: Oh she is. That'll be lovely.	P4 & R arrive at destination.		Deceleration						
Return														
0	0		Blue		1 R: So if we go back to your room P4. P4: Why did we come in here? R: Oh this is just part of the wee walks that I'm doing with you. P4: Oh I see. R: Remember I said there'd be three walks. We're doing two today so that's the first one finished. P4: Yes.	P4 & R commence walk.								
7.4	23	0.32	Green-yellow		2 R: So if we just walk back to your room now, I'll lead the way and we'll have a break before we do the next walk. P4: And what do I have to do between now and then? R: Nothing. P4: Nothing. R: You just follow me that's all. P4: Oh there's a funny smell. R: Yes there is.	P4 & R pass through doors.		Acceleration					Doors: straight corridor	
21.1	34	1.25	Orange		3	P4 & R pass through doors.							Straight corridor	/ Straight corridor (asking what they have to do and commenting on smell). Uncertainty.
30.4	47	0.72	Yellow-orange		4	P4 & R turn corner (sound from TV in background). P4 & R walking towards lift and turn left.		Deceleration					Turning corner: laundry	\ Approaching corner (negotiating it)
36.3	53	0.98	Orange-yellow		5									
44.6	61	1.04	Orange-yellow		6 R: was the painting along here P4? P4: Oh it's further on up.								Straight corridor: looking into room	
49.4	70	0.53	Yellow-green		7	P4 & R turns corner.								
65.3	89-135	0.84	Yellow-orange		8 R: So in here to your bedroom now. P4: Where's it gone?...It was there. Firstly it was hanging there and then it sat there for two or three days. I had never seen it before. R: There's a book there for it...and you're in the room now.									

Table 5-7: Sample Microsoft Excel matrix for F2_P4_W1, showing collated data which can be referenced to synthesise findings².

² The analysis and synthesis of the wayfinding walks generated 39 Microsoft Excel sheets. This is available on CD (Appendix 3).

5.3.1 Fieldwork site two (F2)



Central area: the problem with symmetry and mirroring

Wayfinding issues were observed in the central area of the Y-shaped plan. This area is occupied with seating arranged in a U-shape facing towards a television, leaving the perimeter for circulation. The seating therefore determines and restricts which way people may walk in the area to an extent and when the TV is playing loudly in the background it may be deemed a distraction. A central hub area like this creates a multiple-choice junction which evidently causes wayfinding problems. Another feature of this layout is symmetry or mirroring within the plan. It was seen on more than one occasion that the central area poses as a problem when exiting the area and selecting which direction to travel in. F2_P2 paused during W2 to ask which way to go to get to the parlour upon exiting the dining room into the central area. The effect of this worsened one week later during W3 where F2_P2 chose the wrong direction moving to the right away from the parlour after exiting the dining room (Table 5-8).

Point on plan	Conversation	Behavioural effect	Graph	Action	Map	Image
	R: P2 could you walk me to the parlour or X's room where you do activities? I'll be with you along the way if you need help or want to ask questions or have a P2: Ok. 1 R: Sorry P2...it's down this way...I want you to take me to the parlour. P2: Where's that? R: X's room where you do your baking and activities. P2: Oh aye. R: The same place as the other time...this way. P2: Well you tell me where to go and I'll go. R: This way.	P2 commences walk. P2 turns to LHS and looks at R gestures with left arm to the left. (5 second pause). R points with right hand to the left.		Initial acceleration Wrong direction		

Table 5-8: Common symmetry problems occurred during F2_P2_W3.

F2_P2 they took a wrong turn at the beginning of W3. Above is an excerpt from the dataset (collated in a matrix in Microsoft Excel) and the images below show a sequence of what was seen from the Vicon Revue cameras.

P4 had similar issues with the central area during W2 and W3 but tried to hide this using confabulation. When corrected by the researcher, F2_P4 claimed they were looking for a painting they thought had gone missing from their corridor and wanted to show the researcher around. This resulted in F2_P4 completing a longer route than during W1.

This may have been intentional on P4's part, although the nature of the central area means it is a multiple choice junction so if residents become distracted or choose the wrong turn, they can easily become lost. During debriefing this was an admission by F2_P1 and F2_P4 who said they could get lost if they ventured into an area which was less familiar to them.

Table 5-9 shows that the frequency of stopping and pausing in the central area is greater than in other parts of the building. This optional decision point poses a problem due to the multiple directions which participants could choose to move in. The central area was used in routes for the wayfinding tasks for F2_P1, F2_P2 and P4. While this did not appear to be a problem for F2_P1, F2_P2 had difficulty in the central area pausing and requiring prompting once on W2 and selecting the wrong direction at this point once on W3. Similarly for F2_P4 the central area posed a problem twice on W2 and three times on W3. On W2 and W3, F2_P4 selected the wrong direction on the return journey and walked along the other bedroom wing (Figure 5-6). The difficulty of knowing where to go appears when the participants are leaving the central area as they must choose which direction to travel in.



Figure 5-6: Plans indicating detour taken by F2_P4 during walks two and three which may be related to issues of symmetry.

P4 was insistent that they were looking for a picture on W2 and wanted to show the researcher around on W3. This may be a form of confabulation used to conceal wayfinding issues experienced by P4.

Corridors

The corridors in F2 lacked features (especially upstairs), appearing homogenous with repetitive doors which all looked the same (Figure 5-7). F2_P4 explained that the corridors were too long for some people who are less physically able.



Figure 5-7: Improvements to the decor in F2 to make the corridors less generic.

The image on the left shows how corridors on the first floor of fieldwork site two (F2) look repetitive and can be difficult to distinguish individual's bedrooms. The image on the right shows how downstairs in F2 has been upgraded to improve lighting, incorporate murals and help to make bedroom doors look more individual through the use of colour and signage.

A kink in the corridors along the wings can appear as a dead-end until close (Figure 5-8). Other issues with this are that the parlour wall is directly in line with this wall and the same wallpaper extends out into the corridor which may cause confusion as it might seem that this is part of the parlour. This particular issue with the kink in the corridor was not presented as a problem during the walks but it might be better to differentiate areas so that their purpose is clear. F2_P3 stopped five times in the area of the kink in the corridor. They did not express that they needed assistance with wayfinding but said that they felt tired. At the end of the bedroom wing which F2_P4 walked to on W3 they commented that they did not know what was beyond the point. Although the dead-end and kink in the corridor scenario did not negatively affect the decisions of the participants during wayfinding, these may cause confusion or exacerbate exertion if like F2_P3 and F2_P4 they cannot see where it leads to. Interviewees also expressed the issues with communication and monitoring (see Section 4.3.2).

P4 seems to arbitrarily choose which direction to go in. This may be a form of “exploring” (otherwise referred to as wandering), so there may be a purpose to it. Corridors which branch from primary route corridors posed a problem for P4. This was evident on W2 when F2_P4 took a diversion en-route to the parlour to veer from the direct path onto a tributary path which leads to other bedrooms. Equally the people who occupy these few bedrooms may find it difficult to take the right turn and could easily miss wayfinding cues. F2_P4 selected the wrong direction from corridors twice on W2 (bedroom corridor and the worship room on the other wing) and twice on W3 (window and lounge on the other wing).

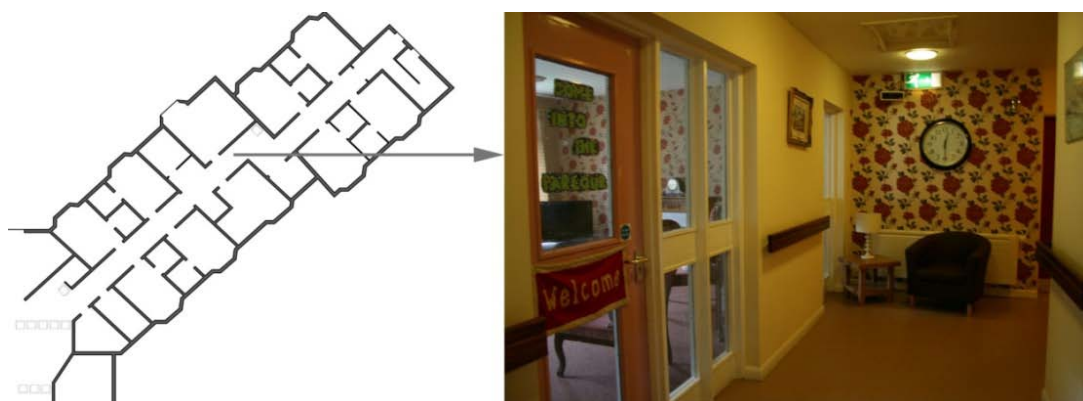


Figure 5-8: *The dead-end effect as a result of a kink in the plan in F2.*

This poses difficulties with seeing to the end of the corridor. The wallpaper which extends to the corridor is the same as in the Parlour which may also be confusing as it might appear as one space.

Straight corridors caused three participants in F2 to pause a number of times during the walks (F2_P2 stopped four times, F2_P3 stopped 14 times and F2_P4 stopped five times). F2_P2 paused once on W2 and three times on W3, requiring prompting on three of these occasions and claiming there was nothing along the corridor on the other. Pausing on straight corridors occurred twice on W2 and three times on W3 for P4. The associated behaviour of F2_P4 is different to that of F2_P2 as they stop and look at things along the corridor, including pictures, handrails and hand sanitisers, however on W3 they require prompting when they ask where to go before they reach the central area (close to the laundry). F2_P3 stopped 14 times across their three walks but this appears to be linked with feeling exerted or tired as they only require prompting twice; once on W2 and once on W3 when they asked where to go. For further detail of these issues experienced during the walks, please refer to Table 5-9.

Feedback and debriefing

F2_P1 explained that they were to recall how they found the parlour by the adjacent bathroom (which is set back from the corridor) as they are familiar with it as it is where they get their leg dressings changed regularly (Figure 5-9). The antiques and furnishings were also important features that F2_P1 highlighted as helping them to know they had arrived at the parlour. Although it was not stipulated, perhaps the glazed screen into this room allows residents to recognise the furnishings and decor and therefore determine it is the parlour.



Figure 5-9: Image showing recess where adjacent bathroom is in relation to the Parlour.

This was used as a wayfinding cue by F2_P1 who knew they were close to the Parlour when they saw it.

Sensory information was noted on a few occasions by F2_P1 who mentioned that they remember the baking which goes on in the parlour and F2_P3 explained they knew the dining room by the smell of the cooking. Signage was commented on by F2_P4 who explained that it was not noticed as it was too high up and could not be seen by the residents. F2_P4 was perhaps the most informative about their experience of wayfinding in F2, explaining it was instinct as they had lived there so long. They also explained that they learned it bit-by-bit and learned that the corridor to their room was to the left of the lift in the central area. It was stated by F2_P4 that a small, compact plan without long corridors is better for people with dementia as they are less likely to get lost.

Wayfinding Walks



Figure 5-10: Decor, furnishings and antiques were mentioned by F2_P1 and F2_P4 who knew the Parlour by these features.



Figure 5-11: High level signage can be difficult to see and furniture and seating layouts can interfere with movement and hinder wayfinding ability.

P4 claimed that the signage in F2 was too high and that many people would not notice it. The left image shows signage placed above the doors. The right image again shows high level signage in the central area and other environmental features, including seating layout and loud TV which may act as distractions for wayfinding.

A summary of F2 can be seen in Table 5-9 and Figures 5-12 and 5-13.

Wayfinding Walks



F2			Route type	Details of issue	Area on route	Decision	Freq.	Total	Comments	Schematic
F2_P1	W1	O		None	N/A	N/A	0	0		
		R		X	X	X	X	X		
	W2	O		POSITIVE: Pauses. identifies destination & asks if R wants to go in.	5. Outside destination (B)	Optional	1	1	F2_P1 expressed feeling tired.	
		R		X	X	X	X	X		
F2_P2	W3	O		None	N/A	N/A	0	0	F2_P1 seems capable of finding their own way.	
		R		X	X	X	X	X		
	W1	O		None	N/A	N/A	0	0		
		R		X	X	X	X	X		
	W2	O		Pauses, asks where to go and is prompted.	2. Central area (A1) 7. Corridor outside destination (B)	Optional Optional	1 1	2		
		R		X	X	X	X	X		
	W3	O		Wrong direction: prompted. Points out hairdressers, asks for prompt. Claims there is nothing down here. Asks where it is and is prompted.	1. Central area. 2. Straight corridor. 3. Straight corridor. 5. Outside destination (B)	Optional Absolute Absolute Optional	1 1 1 1	4	Confusion occurs in central area. Doubt expressed along long corridor.	
		R		X	X	X	X	X		
F2_P3	W1	O		Pauses, talks to R. Pauses (looks at rollator). Pauses & asks if destination (A) is busy. Pauses: "legs feel funny." Break: sits down (tired?) Pauses: needs toilet.	2. Straight corridor. 3. Kink in corridor. 5. Straight corridor.	Absolute Absolute Absolute	1 1 1	3		
		R								
	W2	O		Pauses: asks where (A) is, prompted. Pauses: asks why wheelchair is there. Pauses: tired/hard to walk. Pauses: tired/hard to walk. Pauses: tired/hard to walk. Pauses: asks where to go. Pauses: looks down at feet (tired?)	3. Straight corridor. 4. Kink in corridor. 5. Straight corridor. 7. Straight corridor. 8. Outside destination (A). 2. Straight corridor. 3. Straight corridor at double doors.	Absolute Absolute Absolute Absolute Optional Absolute Absolute	1 1 1 1 1 1 1	5 2		
		R								
	W3	O		Pauses: asks where to go. Pauses: says they're hungry. Pauses: complains about leg pain (tired?) Pauses: complains about leg pain (tired?) Pauses: complains about leg pain (tired?) Pauses: complains about leg pain (tired?)	5. Straight corridor. 6. Straight corridor (close to B). 3. Straight corridor 4. Straight corridor. 5. Kink in corridor (double doors). 6. Kink in corridor.	Absolute Absolute Absolute Absolute Absolute Absolute	1 1 1 1 1 1	2 4	W3 is in reverse direction to W1 & W2. F2_P3 appears to experience less issues on the walk to the bedroom than to the living room.	
		R								
F2_P4	W1	O		Pauses: to point out en-suite to R.	2. Outside en-suite.	Optional	1	1	Describes the parlour as having fancy decor.	
		R		None	N/A	N/A	0	0		
	W2	O		Pauses: points out craft room. Wrong direction: distracted. Wrong direction: prompted. Asks where they are going. Slows down. Pauses: mentions picture. Wrong way: distracted. Wrong way: distracted. Pauses: unsure about end of corridor. Pauses: looks at pictures (turned around).	4. Corner on corridor. 5. Junction to corridor. 6. Bedroom corridor. 7. Central area (not prompted). 4. Entering central area. 6. Central area (other wing side). 7. Other wing. 10. Workshop room. 12. Straight corridor. 14. Straight corridor.	Absolute Optional Optional Optional Optional Absolute Absolute Absolute Absolute Absolute	1 1 1 1 1 1 1 1 1 1	4 6	Veers off to bedrooms. (problem with junction?) Veers off to other wing. (problem with central area?)	
		R								
	W3	O		Looks to RHS (wrong way). Pauses at window (wrong way). Pauses: asks where to go. Pauses: points out signage (too high). Pauses: comments on dead end. Pauses: hand sanitiser (asks). Pauses: describes handrail. Wrong direction. Other wing. Wrong direction: pauses at window. Wrong direction: points out room. Pauses: comments on dead end.	3. Straight corridor. 4. Straight corridor. 7. Straight corridor (laundry). 12. Central area. 2. Straight corridor. 4. Straight corridor. 5. Central area. 6. Central area (other wing side). 9. Lounge (other wing). 10. Lounge window. 16. Dead-end.	Absolute Absolute Absolute Optional Absolute Absolute Optional Absolute Absolute Absolute Absolute	1 1 1 1 1 1 1 1 1 1 1	4 7		
		R								

- Absolute decision
- Optional decision area and potential direction of travel
- Control point (secure unit)

Table 5-9: Data sheet for F2 showing types of issues experienced during the walks and how often they occurred.

Wayfinding Walks

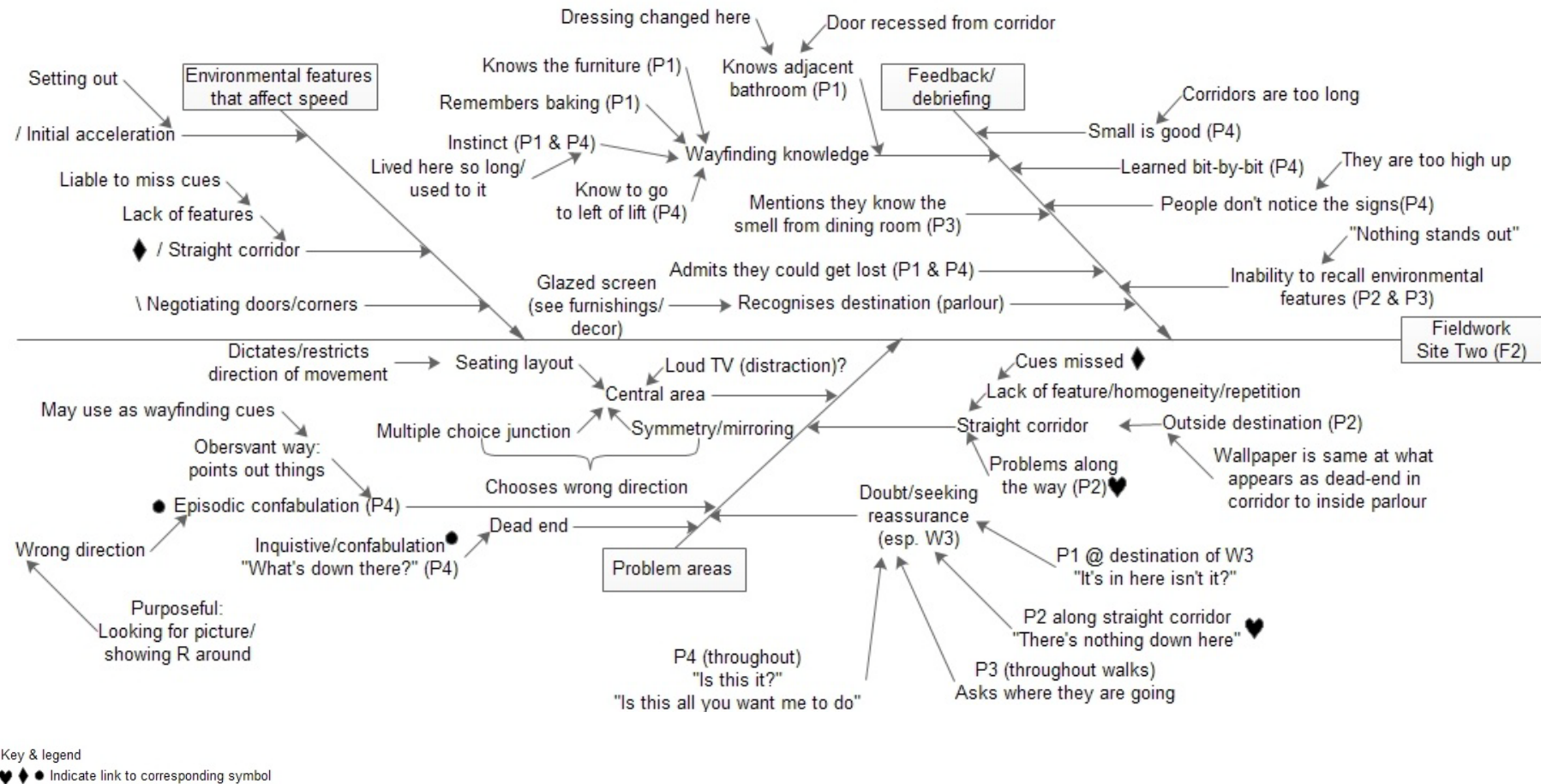


Figure 5-12: Summary of themes found presented as a cause and effect diagram from walks conducted at fieldwork site two.

Wayfinding Walks

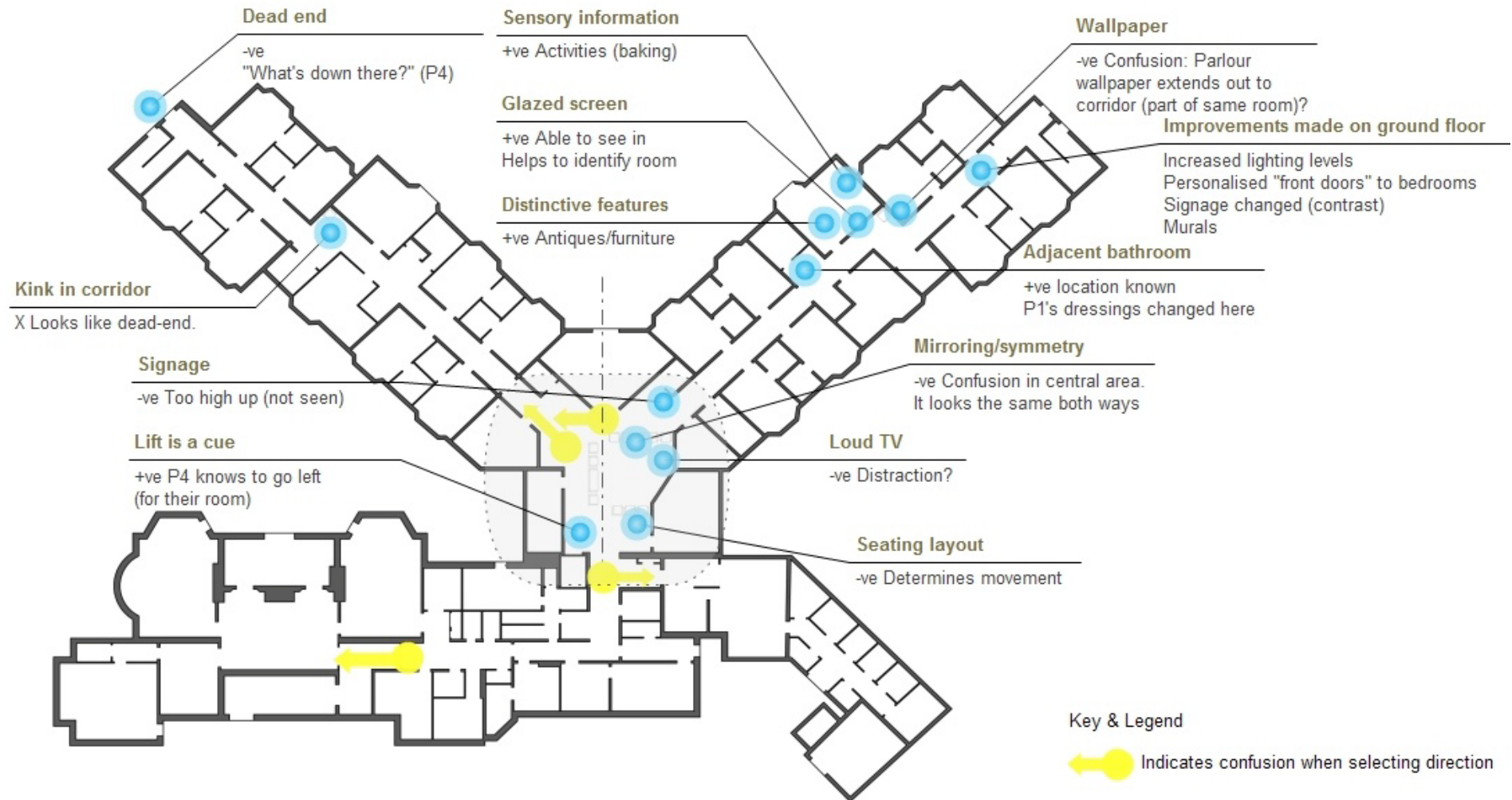


Figure 5-13: Summary of wayfinding issues for fieldwork site two.

5.3.2 Fieldwork site three (F3)



Central area: a recurring issue

Once again the central area was observed to be problematic in F3 with similar reasons to F2. The layout of F3 follows a H-shaped plan, where the two nearly identical T-shaped units meet in the central area (like a chiasma junction). Difficulties in choosing the right direction were seen in F3_P1 who selected the wrong way four times across all the walks, even in the researcher led walk on W1 where he argued his room was on the other side (Figure 5-14). In addition to this, F3_P1 paused and required prompts on two occasions, once on W2_O and once on W3_R. Consequently F3_P1 stopped a total of six times during the three walks. This problem occurred during the outbound and return directions suggesting difficulty in choosing a route both ways.

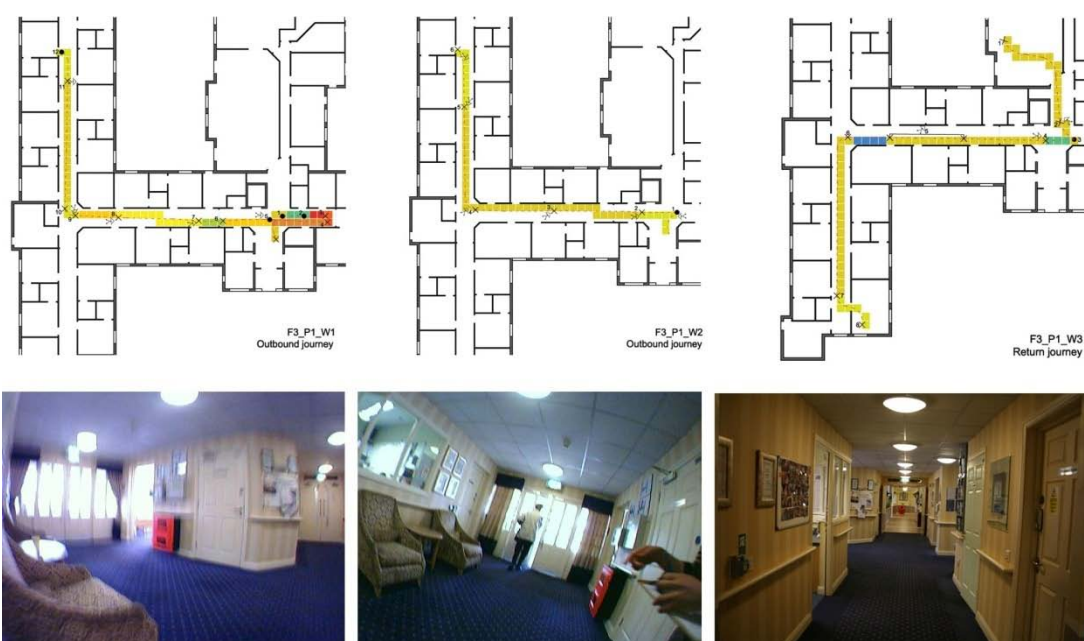


Figure 5-14: The central area of F3 posed many issues.

This included symmetry related issues, multi-choice junctions, looking the same each way and obvious entrance doors. The top set of plans show difficulties experienced by F3_P1 who selected the wrong way each time within the central area as he was convinced his room was on the other side.

The problem with symmetry and both routes looking the same was also an issue for F3_P2 who paused four times and F3_P3 who checked which way to go once on W2_O and paused three more times during W2 and W3.

In addition to this, the central area in F3 has the main entrance opening directly onto it. This makes the entrance obvious to residents and can be distressing for residents who want out and cannot understand why they are not allowed out. During W2 and W3 (where the participant led the walk), F3_P4 became fixated on wanting out, especially when they were in the vicinity of the central area. This caused F3_P4 to pause and need prompting three times (once on W2 and twice on W3) and walk in the wrong direction towards the entrance/exit doors once on W3 (Figure 5-15). Having witnessed this and in light of responses from interviewees which concur with this, it should be an important design consideration to make an effort to conceal entrance doors.

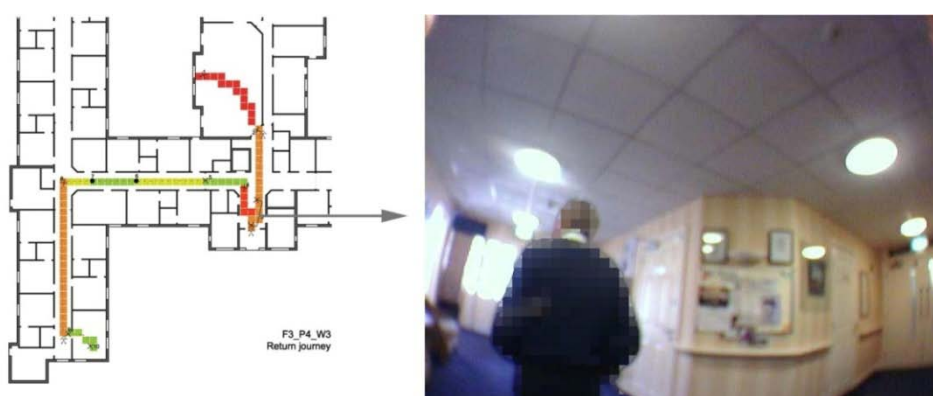


Figure 5-15: The prominent location of the entrance in F3 opens directly onto the central area.

The obvious entrance doors created problems during the wayfinding walks, particularly with F3_P4 on W3 who became increasingly agitated when he could not get out.

The nature of a T-junction: symmetry and missing wayfinding cues

Both units within F3 have major T-junctions which present a multiple-choice for residents (Figure 5-16). This posed a problem for all residents who participated in the walks where F3_P1, F3_P2 and F3_P3 all slowed down or paused on approach to the T-junction. Participants one and two (F3_P1 and F3_P2) asked the researcher for prompts on which way to go, whereas F3_P3 took some time but identified the correct way. F3_P4 on the other hand, missed the cue to turn right on one occasion on their way to the dining room (via the central area) on the outbound journey of W2 and walked straight ahead along the bedroom corridor. F3_P1 experienced difficulty with the T-junction three times (once per walk; twice in the outbound direction and once during the return journey). F3_P2 and F3_P4 had difficulty on one occasion during W2 (Table 5-10). It was found that the T-junction, like the central area junction was confusing on both outbound and return legs of the walks.



Figure 5-16: Problematic T-junctions in F3.

The T-junctions in F3 caused participants to slow down and in the case of P4_W2_O, select the wrong way and continue along the corridor away from the destination of the dining room.

Straight corridor with locked doors

To separate the two units in F2, locked doors are in place at the end of straight corridors. When these are locked, the colour of the doors which are the same as the walls, appear as a dead-end (Figure 5-17). This may have caused confusion during the walks and caused participants to slow down, rather than accelerating as was found in other straight corridors. This can be seen in Table 5-10 during P2_W3 on the outbound and return walks and on three occasions for F3_P4 as they slowed down on approach to the locked doors.



Figure 5-17: Sections of corridor in F3 could be mistaken for dead-ends.

A Vicon Revue snap shot of the straight corridor from the central area on approach to the bedroom wing which is separated by a locked door which could appear as a dead-end.

Straight corridors

Similar to the other fieldwork sites, straight corridors caused issues with participants, despite being classified mainly as absolute decision points (requiring no decision to be made about where to go). F3_P1 paused on one occasion, F3_P2 paused seven times, F3_P3 paused four times and F3_P4 paused twice. Pauses which required prompting were once by F3_P1 and once by F3_P2. Other causes for pausing along corridors are when F3_P2 speaks to the researcher four times. F3_P3 paused and gave the researcher a sweet on one occasion, they then picked up a tissue (during W1) and on W3 they paused once in both directions to talk to the podiatrist in a room along the corridor. This participant paused once on W1 to speak to the researcher and paused on W3_R when they expressed that they wanted a certain staff member.

Room numbers: wayfinding knowledge

Room numbers were mentioned during debriefing by some of the participants as reasons behind how they knew where they were going when finding their bedrooms. F3_P2 during a moment of clarity correctly recalled their room was number 26 and F3_P3 pointed out their room once during the outbound journey of W3. F3_P1 however said their room number was 36 during a debriefing session but this was not correct. After asking staff and F3_P1's next of kin, it transpired that this was an old address where F3_P1 once lived. Room numbers appeared to be helpful to some people, but perhaps in the case of people like F3_P1, a previous residence might be more relevant and easier for them to recall.

Feedback and debriefing

All participants showed an inability to recall features of the physical environment when asked about what stood out during debriefing. Common responses included "Nothing stands out" or "Don't remember." When asked how they found their way around, descriptions included that it was down to familiarity or instinct. F3_P2 said that they had been here before so they know it and F3_P3 claimed that they just know it because they have been here a long time and it was their home. These types of response were also expressed in F2.

Table 5-10 and Figures 5-18 and 5-19 provide an overview of F3.



F3			Route type	Details of issue	Area on route	Decision	Freq.	Total	Comments	Schematic
F3_P1	W1	O		Wrong direction	1. Central area (other wing)	Optional	1	3		
		R		Wrong direction	2. Central area	Optional	1			
		O		Pause: asks which way	3. Straight corridor	Absolute	1			
	W2	O		Pause: looks both ways	3. T-junction	Optional	1	1		
		R		Wrong direction	1. Central area (other wing)	Optional	1	2		
		O		Glimpses to left	4. T-junction	Optional	1			
F3_P2	W1	O		Pause: prompted	6. Central area	Optional	1	1		
		R		Pause: prompted	7. Central area	Optional	1	1		
		O		Wrong direction	3. Central area	Optional	1	2		
	W2	O		Slows down	5. T-junction	Optional	1			
		R		Asks if R will bring them back	1. Straight corridor	Absolute	1	2		
		O		Says they're nervous	3. Straight corridor	Absolute	1			
	W3	O		Break: sit down	4. Central area	Optional	1	3		
		R		Asks if it is far	2 Central area	Optional	1			
		O		Pause: looks behind at R	3 Central area	Optional	1			
	W1	O		Pause: speaks to R	4. Straight corridor	Absolute	1	3		
		R		Pause: asks where they are going.	5. Straight corridor	Absolute	1		Central area	
		O		Pause: asks where it is, prompt.	6. T-junction	Optional	1		T-junction	
F3_P3	W1	O		Knowledge: doors	3. Straight corridor	Absolute	1	2		
		R		Pause: asks to sit	6. Central area	Optional	1			
		O		Slows down (doors)	2. Straight corridor	Absolute	1	2		
	W2	O		Pauses: speaks to R	4. Straight corridor	Absolute	1		Improvement on return	
		R		Slows down (doors)	4. Straight corridor	Absolute	1	1		
		O		Pause: hands R a sweet	5. Straight corridor	Absolute	1	1		
	W3	O		Picks up tissue	6. Straight corridor	Absolute	1	1		
		R		Pause: asks where to go	5. Central area	Optional	1	1		
		O		Pause	2. Dining room doors	Absolute	1	2		
	W1	O		Pause	3. Central area	Optional	1			
		R		Pause: coughs and sees visitors	3. Central area	Optional	1	3		
		O		Pause: Speaks to podiatrist.	8. Straight corridor	Absolute	1		Difficulty with central area	
F3_P4	W1	O		Identifies and looks in.	10. P3's own room	Optional	1			
		R		Pause: speaks to podiatrist.	5. Straight corridor	Absolute	1	2		
		O		Pause: looks in.	8. Central area (n. Station)	Optional	1		Reduced performance	
	W2	O		Pause: says they are cold	2. Straight corridor	Absolute	1	1		
		R		Pause: open doors	2. Straight corridor	Absolute	1	1		
		O		Pause: prompted	3. T-junction (missed turn)	Optional	1	3		
	W3	O		Pause: open doors	4. Straight corridor	Absolute	1			
		R		Pause: prompted	6. Central area	Optional	1			
		O		Pause: open doors	3. Straight corridor	Absolute	1	1		
	W1	O		Pause: prompted	6. Central area	Optional	1	1		
		R		Wrong way: exit doors	3. Central area	Optional	1	3	Wants out: agitated	
		O		Prompt: turn around	4. Central area	Optional	1		Problematic: T-junction	
	W2	O		Prompt: aggressive, wants S1	7. Straight corridor	Absolute	1		Central area	
		R								
		O								

Table 5-10: Data sheet for F3 showing types of issues experienced during the walks and how often they occurred.

Wayfinding Walks

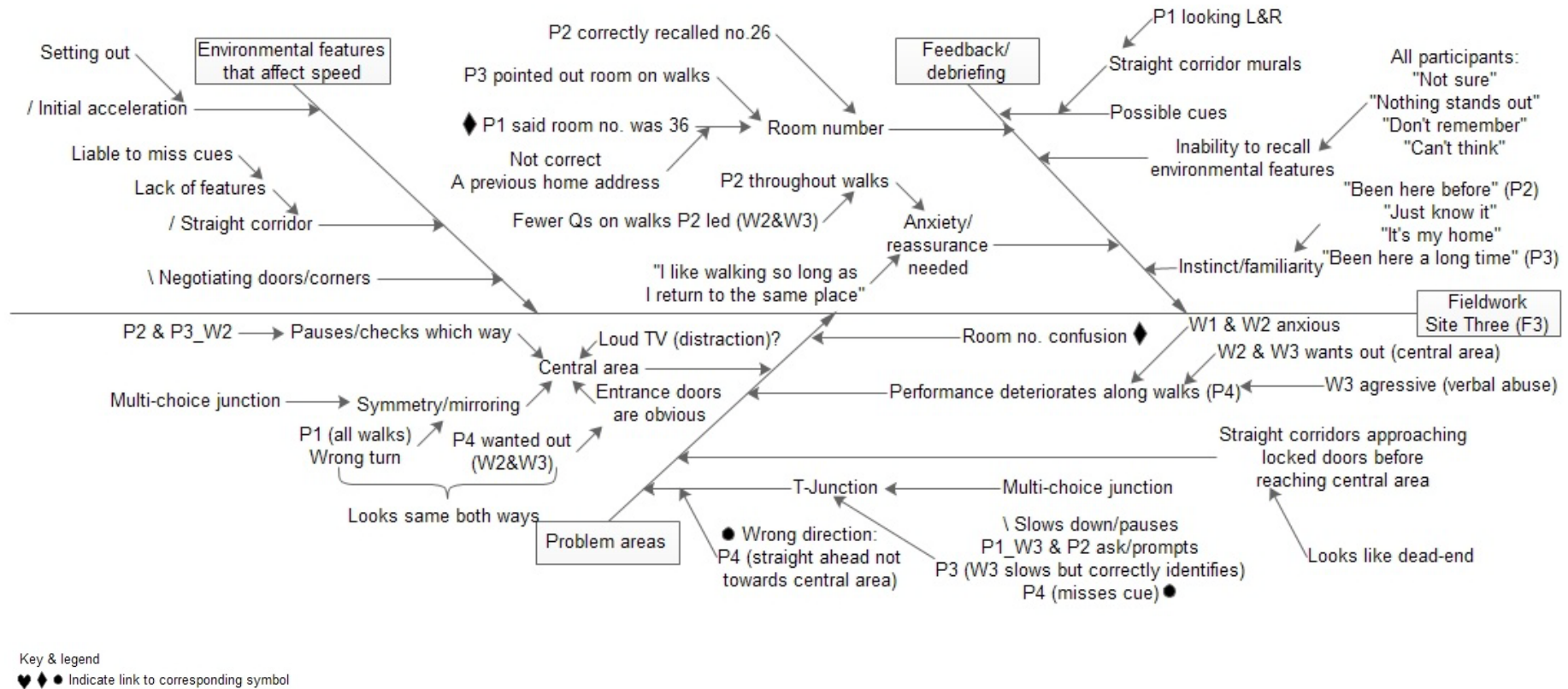


Figure 5-18: Summary of themes found presented as a cause and effect diagram from walks conducted at fieldwork site three.

Wayfinding Walks

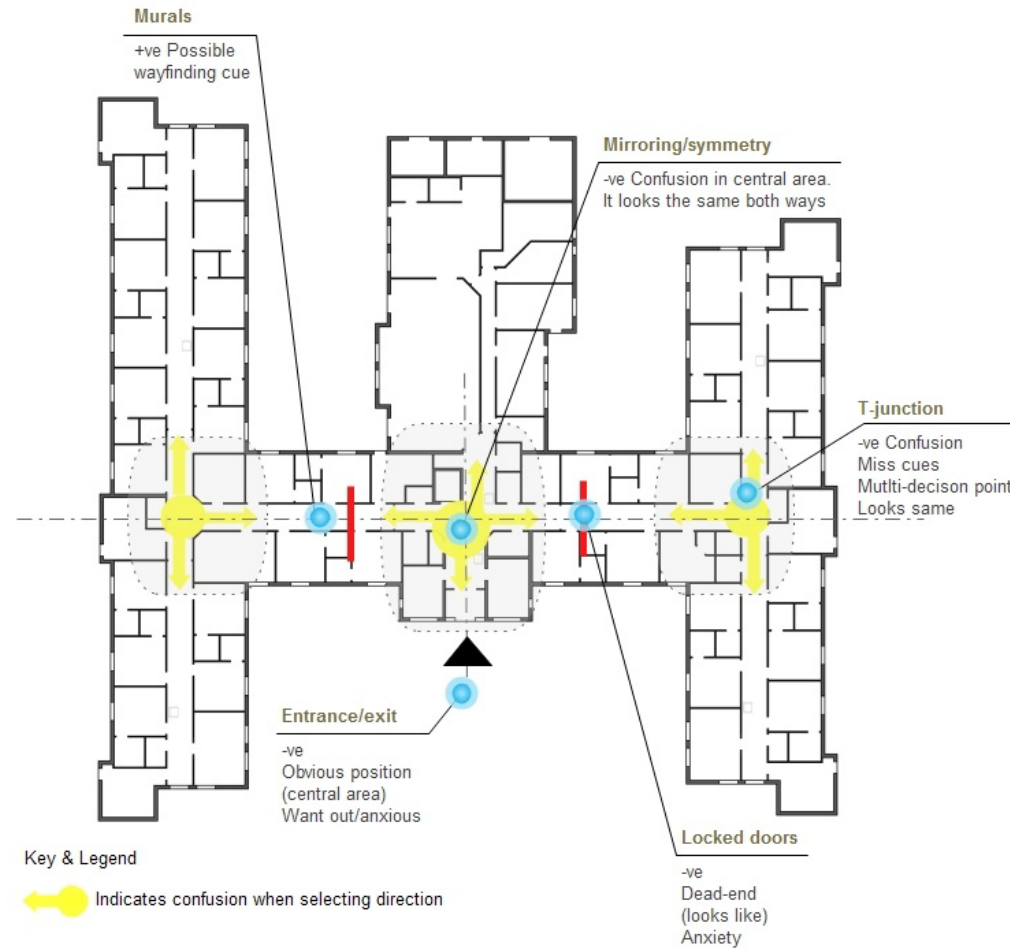


Figure 5-19: Summary of wayfinding issues for fieldwork site three.

5.3.3 Fieldwork site four (F4)



The problem with T-junctions

The layout of F4 is (for the most part) linear following an extension which elongated the corridor. It has a circuit area which attaches onto one end of the linear plan. Initially the building was described as being more of a linear plan with a small circuit part adjoining this. Criticism about the circuit part of the plan was that it was not used as much as the linear part and it was difficult to encourage residents around the circuit so items of interest were placed in the corner (Figure 5-20). This circuit part of the building encloses a courtyard garden but lacks accommodation along this to encourage residents to use it. The corners of the circuit part of the building may otherwise appear as dead-ends. F4_P1 experienced issues with T-junctions on five occasions (Table 5-11, p.170).



Figure 5-20: Straight corridor on the circuit of F4 make the corners appear as dead-ends.

Attempts to encourage people to use the circuit has been made by placing items of interest on the corner. Design flaws with this home mean that the circuit has limited activity on it as it serves merely as a corridor loop, rather than a route to other significant spaces.

Wayfinding Walks

The implication of adding an additional return loop or circuit to and from a linear plan means that two T-junctions occur (Figure 5-21). Similar to other homes, problems were seen at these T-junctions (at Memory Lane and at the nursing station close to the lounge). F4_P1, like many of the other residents is used to sitting in the lounge and looked in or paused outside it on the outbound journey. During the return journey (via the circuit) they paused at the T-junction, looking left and right at the multi-decision point. W3 is shorter for F4_P1 as they are so used to sitting in the lounge they decided to finish the walk by sitting down in there. This is why there was an anomaly for F4_P1_W3 which showed a shorter time (but also a significantly shorter distance). The T-junction at Memory Lane at the beginning of the return walk poses a multiple-decision point problem where residents can turn right around the circuit or go left to other parts of the unit. Deterioration was evident on the return part of W3 where F4_P1 turned left in the wrong direction and was corrected by the researcher.



Figure 5-21: Problems with T-junctions in F4.

This was seen when F4_P1 had difficulty selecting the right way and was particularly distracted close to their lounge as they were used to sitting in it.

Debriefing and other considerations

The effect of the straight corridor caused an acceleration in speed for F4_P1, but similar to the other homes, residents may be liable to miss cues due to the generic appearance of the bedroom doors (Figure 5-22). Generally F4_P1 seemed to be reliant on the researcher to take them around as they displayed a lack of evidence (particularly on W3) where they were going. During debriefing, F4_P1 was unable to recall environmental features of the physical environment but did say that they found their way by looking “at the road” (referring to the corridor). The corridor and handrail are important in guiding residents around the home. This was mentioned in a staff interview where they described that residents found their way by holding onto the handrail and pausing at the apertures where the door was, allowing them to see in. Another opinion expressed by F4_P1, which is not directly linked to wayfinding was the importance of having a toilet nearby for comfort. Again these considerations can help to inform design for dementia

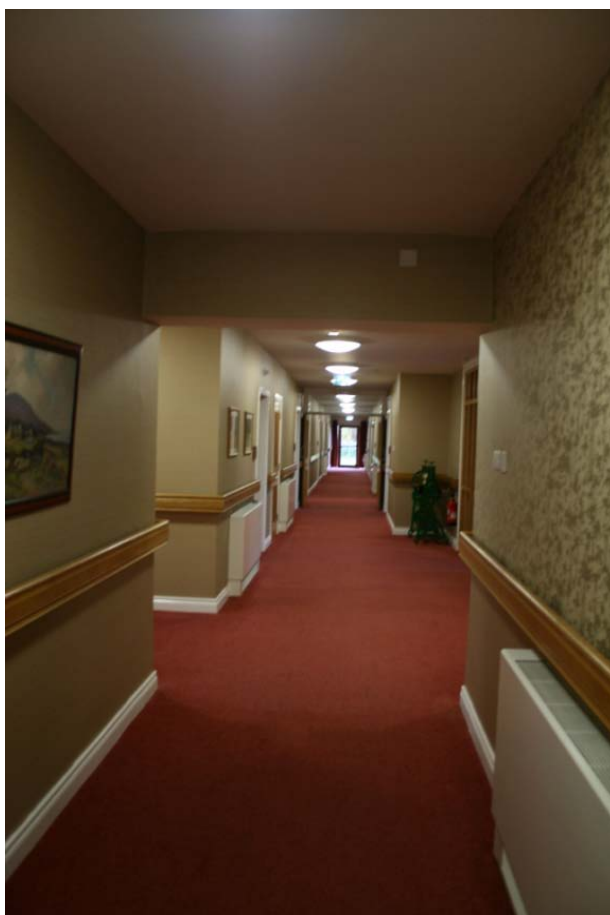


Figure 5-22: Repetitive corridors in F4 have homogenous doors which are difficult to differentiate from one another.

F4_P1 expressed that they liked the carpet beneath their feet as it was warm and the handrail was useful .

Restrictions with fieldwork site four (F4)

Due to the nature of the residents who are catered for in F4, it was only possible to recruit one participant who had the physical ability and cognitive capacity to understand and complete the walks. This is a limitation with F4, however after completing work within the other homes, residents experienced similar issues so it became predictable which areas of the building may affect wayfinding. In addition to this one of the residents in F4 who is physically mobile but was deemed to be unable to participate as they would not understand the task or communicate with the researcher was observed walking around the circuit part of the plan of their own accord. They did this several times until they stopped at the T-junction to the living room where they were then guided and assisted into the lounge where they sat down.

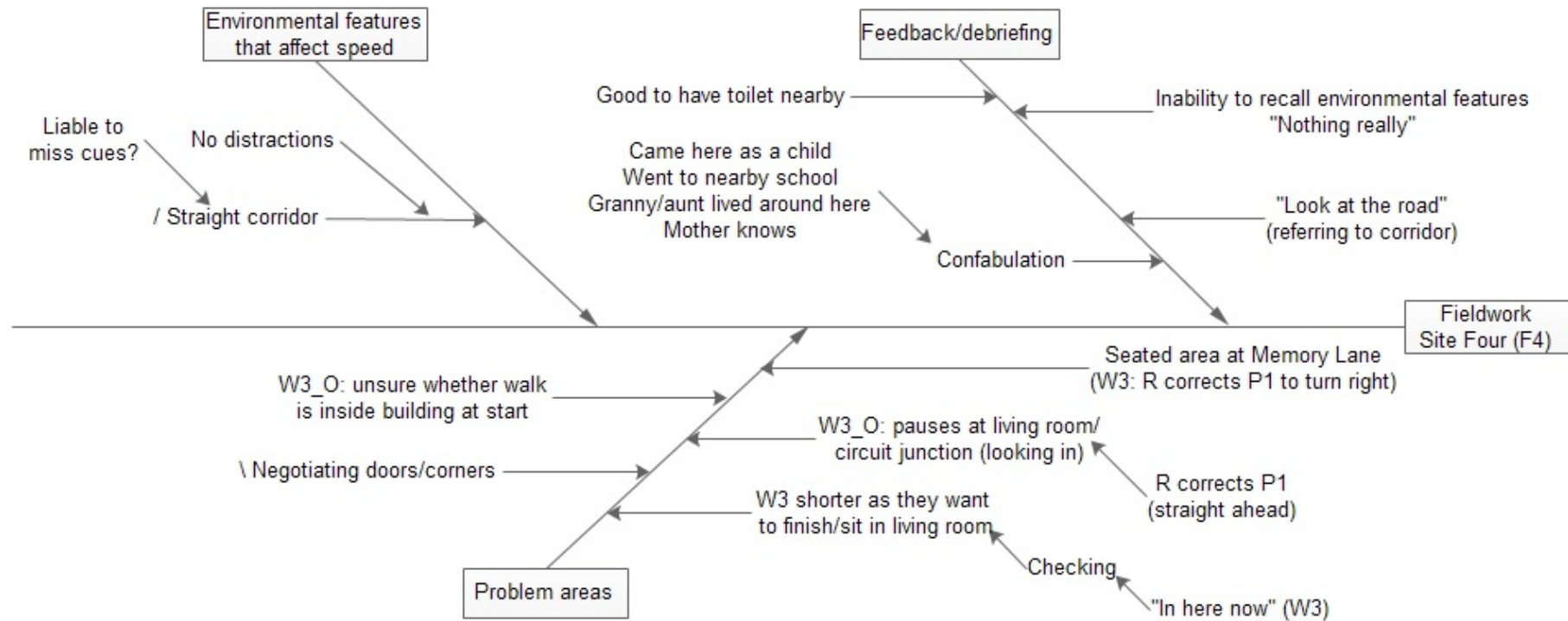
A summary of findings from F4 can be found in Table 5-12 and Figures 5-23 and 5-24.



F4			Route type	Details of issue	Area on route	Decision	Freq.	Total	Comments	Schematic
F4_P1	W1	O		Pause: comments on handrail. Pause: looks at mangle. Pause: looks into bedroom (RHS). Pause: looks at garden. Break: sits down. Pause: to let staff past.	2. Straight corridor. 4. Straight corridor. 6. Straight corridor. 5. Straight corridor (circuit). 6. Lounge (circuit). 10. Junction: nurses' station.	Absolute Absolute Absolute Absolute Optional Optional	1 1 1 1 1 1	3 3		
		R								
		O		Pause: let staff past. Wrong direction: prompted. Pause: looks out window.	6. Junction: nurses' station. 1. T-junction. 3. Circuit corner.	Optional Optional Absolute	1 1 1	1 2	Central area (choice)	
	W2	O		Pause: asks where to go, prompted. Pause: looks right at pictures. Pause: looks in to lounge. Pause: looks out window (RHS). Pause: comments on weather. Pause: wants into lounge.	1. Straight corridor. 5. Straight corridor. 8. Junction: nurses' station. Circuit: straight corridor. Circuit corner. Junction: nurses's station.	Absolute Absolute Optional Absolute Absolute Optional	1 1 1 1 1 1	3 3	Junction: nurses station (close to lounge) T-junction	
	W3	O								
		R								

Table 5-11: Data sheet for F4 showing types of issues experienced during the walks and how often they occurred.

Wayfinding Walks



Key & legend

♥ ♦ ● Indicate link to corresponding symbol

Figure 5-23: Summary of themes found presented as a cause and effect diagram from walks conducted at fieldwork site four.

Wayfinding Walks

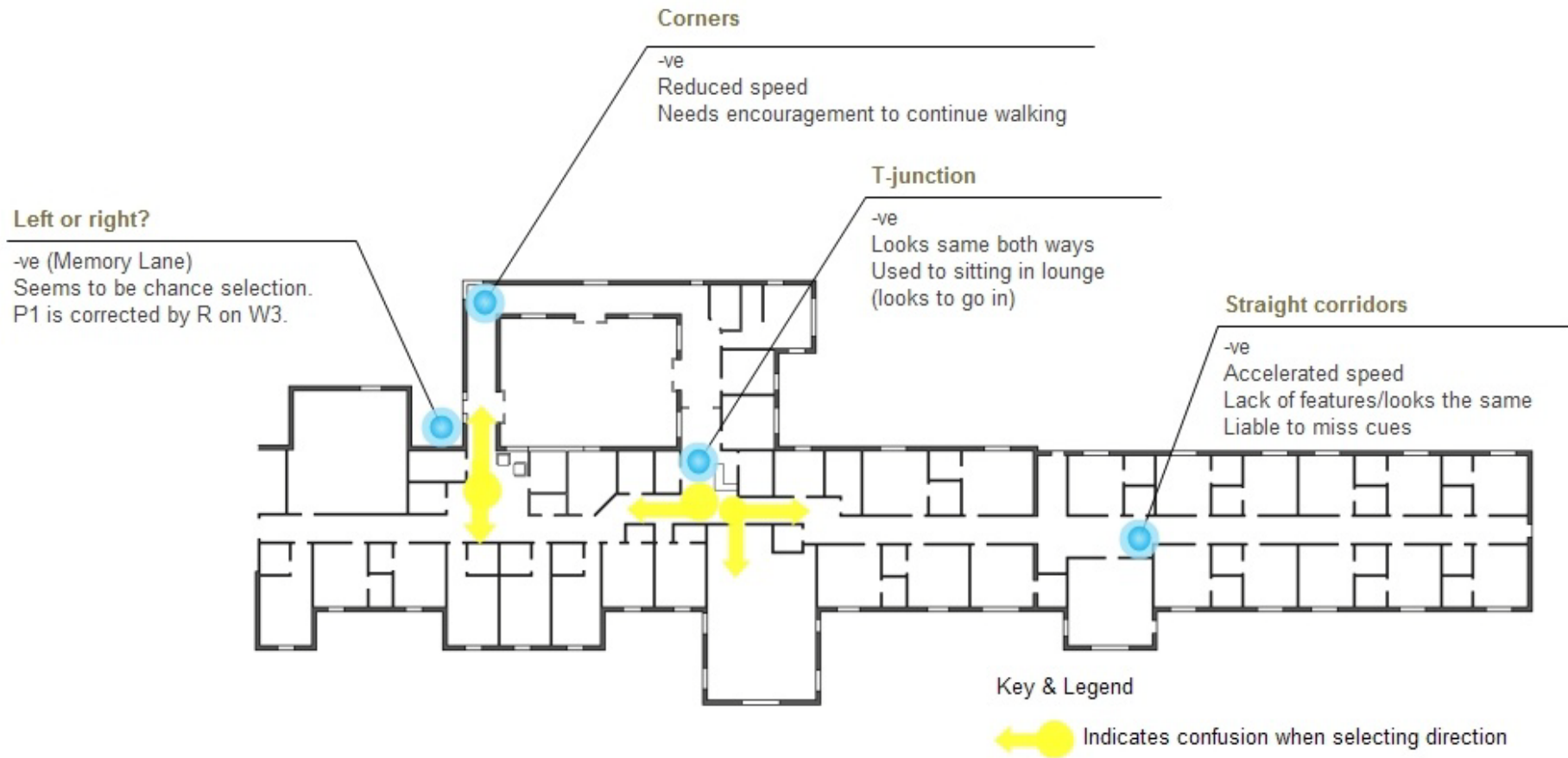


Figure 5-24: Summary of wayfinding issues for fieldwork site four.

5.3.4 Fieldwork site five (F5)



Central area: featuring as a wayfinding issue again

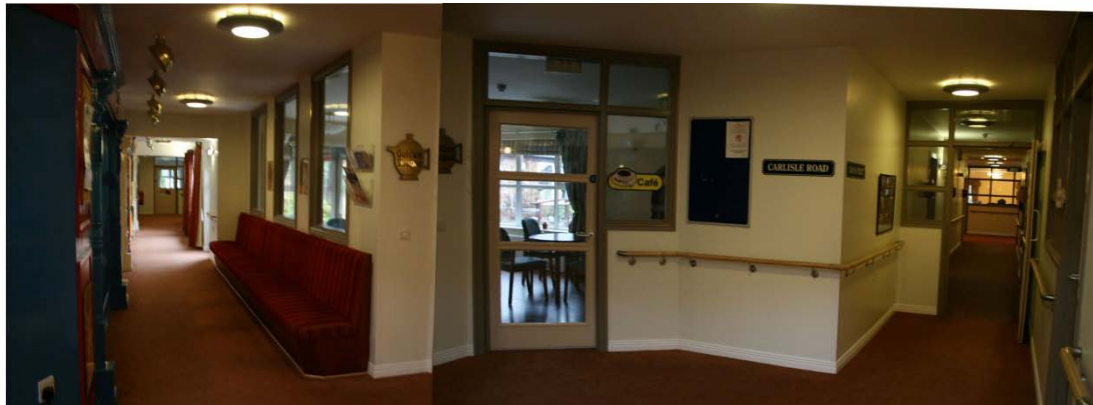


Figure 5-25: The junction between the central area and corridors leading to other areas.

This area creates multiple choice in directions to choose to go in and caused pausing or slowing of many of the participants. However, most people chose to walk by the shop corridor on the left as opposed to the bedroom corridor on the right.

The central area was seen to be problematic again in F5, especially when leaving it to go to other parts of the building (Figure 5-25). The central area follows a circuit type plan (in a figure of eight) with a central circular area that connects to other parts with star-like connections forming corridors to the other parts of the building. The connection of the central area to the circuit part of the plan caused F5_P1, F5_P2 and F5_P3 to pause when walking away from the central area junction to the circuit corridors. F5_P1 paused twice and F5_P2 once when they were deciding which direction to go. While F5_P3 (who paused twice) needed prompting, F5_P1 and F5_P2 displayed knowledge that it was possible to go either way which would result in them arriving at the same place, they both choose to walk along the shop corridor (Table 5-12). This corridor has a source of natural light from the courtyard garden, making it brighter and may also be more desirable because the shops provide interest and sensory stimulation.

An anomaly to this was during W3, when F5_P1 opted to walk by the double-banked bedroom corridor first (anti-clockwise) as opposed to along the shop corridor which is where they began on W1 and W2 (see Figure 5-26). This may have shown that F5_P1 understood the same as F5_P2 who knew if either way was chosen, they lead to the same place, although when asked why F5_P1 chose this way on W3 they responded saying there was no reason.

Wayfinding Walks

If this was not intentional, it might suggest that choice of direction is arbitrary which could lead to getting lost or needing to formulate wayfinding solutions as they walk along, rather than planning ahead.



Figure 5-26: *The shop corridor on the left and double banked bedroom corridors on the right.*

The shop corridor may have been selected over the bedroom corridor as it has greater levels of natural light and views to the garden and other spaces because of the internal and external glazing. The shops also provide sensory stimulation and interest as opposed to the double-banked homogenous bedroom corridor.

The spatial quality of the central area in F5 is uplifting in comparison to that of F2 or F3 with a generous ceiling height which is clerestory lit and feels more like an outdoor piazza (Figure 5-27). Despite what seems to be a better design approach to the central area in F5 coupled with the refurbishment which saw improvements to signage and possible wayfinding cues, the same issues of symmetry and the creation of a multi-decision points were seen to affect wayfinding.



Figure 5-27: *The central area in F5.*

F5's central area is perhaps more successful than the other homes studied as the entrance is concealed, it feels like an outdoor space because of the high levels of natural light provided by the clerestory and it is a versatile space with adjacent smaller, quieter spaces which can be used for a variety of activities or social occasions. The image on the left was taken within the central area and the image on the right is approaching from the bedroom corridor.



Figure 5-28: The corners of the circuit are chamfered which helps to encourage residents to continue walking.

Corners of the circuit

The layout and design of F5 means that the entrance and staff areas are inconspicuous and access to secure outdoor space is provided which gives a sense of freedom of movement throughout the building. The effect of the circuit also provides an ample area for walking in a compact space without feeling confined (Figure 5-28). The effect of the corners on the circuit caused F5_P1 to pause once, F5_P2 paused twice, F5_P3 paused three times and F5_P5 paused on five occasions (Table 5-12). In some of the cases the pauses related to looking into the reminiscence room or stopping to chat to the researcher. Some issues with the corners of the circuit were seen during the walks, including F5_P3 who missed the cue to enter their lounge (situated on the corner) and continue to walk around the circuit (Figure 5-29). The corners also create a multi-decision point which caused F5_P5 to check which way they needed to go on W2 when they set out from the lounge to go to the central area. Indeed either way is a viable route but it causes doubt. The corner at the reminiscence room caused some difficulty with F5_P3 pausing and asking if they had to walk much further (although this may be explained by F5_P3 feeling tired from walking). F5_P2 paused at the corner of the reminiscence room during W2 to ask if the researcher wanted them to go in which was met by a prompt which re-directed F5_P2 to continue on the path of the destination of the resident-relative meeting room.

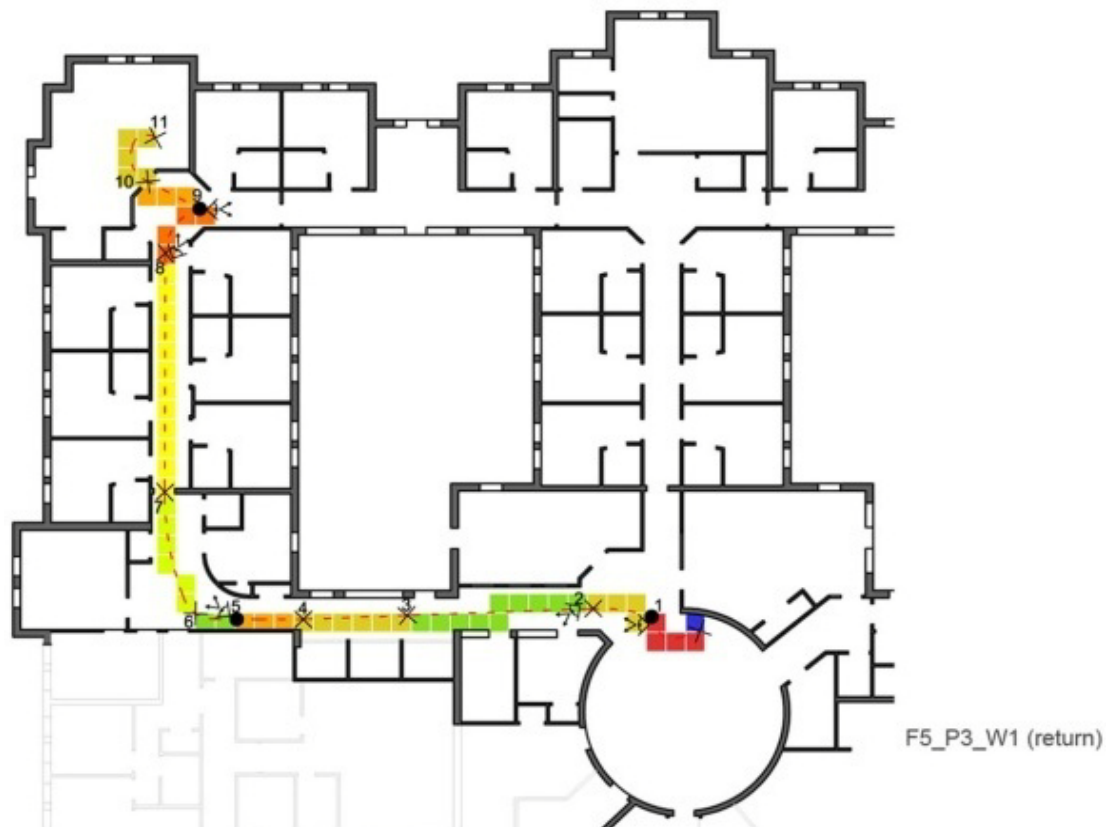


Figure 5-29: The chamfered corners of the circuit also create a multi-choice junction.

This caused F5_P3 to miss the cue to enter the lounge on the left as they continued walking on the circuit.

T-junctions

Similar to the other fieldwork sites, the T-junction posed problem (Figure 5-30). This was experienced by F5_P1 and F5_P2 who walked in the direction which incorporated this. It was an issue on both the outbound and return journeys and affected F5_P1 twice and F5_P2 once (Table 5-12). In one case symmetry is problematic but on the opposite journey the issue was the junction which was a missed cue (towards the central area). Although the circuit plan means that residents will eventually make their way around the building, the effects of not being able to find a location efficiently can cause anxiety and frustration.



Figure 5-30: *The T-junctions in F5 (similar to the other homes) are problematic as they give the option of more than one direction causing a reduction in speed, pausing and confusion about which way to go.*

The T-junction: created by the double circuit (figure of eight plan)

The junction where the two circuits meet on the garden corridor to the bedroom corridor was seen to be an issue in both directions. F5_P1 missed their cue to turn right during W2, causing them to walk straight ahead. Similarly, F5_P2 paused during walks two and three and pointed out that it was possible to walk straight ahead on W2 as well as turning right to get to the central area. Although this is true, it is a longer route (almost twice as long), requiring a walk around the other circuit. When F5_P1 travelled anti-clockwise on W3 they paused and required a prompt when at the T-junction (where the bedroom corridor met the garden corridor). Similar to F3 and F4, layout issues such as the T-junction present a multi-decision point, causing difficulties for wayfinding.

Straight corridors

All participants displayed similar stopping behaviour to that of those living in the other fieldwork sites. This caused F5_P1 to pause nine times, F5_P2 to pause eight times, F5_P3 to pause once, F5_P4 to pause twice and F5_P5 to pause five times (Table 5-12). Most of these pauses were linked to F5_P1 and F5_P2 looking out at the garden, memory box, shops and placard, whereas F5_P3 paused to rub their leg which they complained was sore and F5_P5 wanted to show the researcher their room or paused to let someone past. Participant conversely paused at the junction to their bedroom wing which was situated off the main figure of eight plan and required prompting on both occasions.

Feedback and debriefing

Many of the participants were unable to recall which environmental features stood out, by claiming that nothing really stood out and that their wayfinding processes were either automatic or by instinct. F5_P4 explained that it “doesn’t matter which way you go, you come back again.” Knowledge of the physical environment in F5 was then shown when F5_P4 said that “you see a thing, then you become more sure.” This was followed by F5_P4 talking about how “the road (referring to the corridor) takes you there” and that you walk past the shops and then arrive in the big place (the central area). All participants correctly identified their rooms either along the walks and/or referring to how they knew them by the number afterwards. Room number was especially relevant to F5_P5 who was able to say that his room was number three. In a connected interview with P5’s next of kin, it was posited that F5_P5 knew their room number because they carried a key fob with the number “3” written on it. Residents who are capable of finding and unlocking their own room, are given the option to carry a key to promote independence, dignity and privacy.

Wayfinding walks conducted with F5_P1 and F5_P2 involved them pointing out various features which may be possible cues, these were also discussed afterwards during the debriefing. The following features were mentioned:

- Signage
- Room numbers
- Memory boxes
- Shops
- Gardens

Wayfinding Walks

There was less of an emphasis on the memory boxes during the debriefing sessions and although these were pointed out on the walks, F5_P1's next of kin explained that F5_P1 did not like hers being filled as she did not want to be identified and felt she did not need it like the others did. Part of these pointing out and showing around mechanisms may relate to confabulation which F5_P1 was reported of doing by their next of kin and staff. It is therefore difficult to determine whether F5_P1 uses the items pointed out during the walk as wayfinding cues as they do not recall or refer to them as much during debriefing as F5_P2 did.



Figure 5-31: Positive environmental features in F5 which were discussed by participants during debriefing.

Clockwise from top: top-lit corridor with views out to the courtyard garden, view to garden back to top-lit area from the shop corridor, door numbers and memory boxes.

Table 5-12 and Figures 5-32 and 5-33 provide a summary of the issues encountered in F5.

Wayfinding Walks



F5		Route type	Details of Issue	Area on route	Decision	Freq.	Total	Comments	Schematic
F5_P1	W1	O	Pause: decide which way	1. Central area	Optional	1	3		
		R	Pause: garden window	4. Straight corridor	Absolute	1			
			Pause: comments on memory box	9. Straight corridor	Absolute	1			
	W2	O	Pause: garden window	4. Straight corridor	Absolute	1	2		
		R	Pause: opening placard	8. Straight corridor	Absolute	1			
			Pause: pulls up trousers	3. Straight corridor	Absolute	1	3	Looks out to garden (ref pt?)	
	W3	O	Pause: garden window	4. Straight corridor	Absolute	1			
		R	Pause: looks into reminiscence room	6. Corner of circuit	Absolute	1	2		
			Pause: looks right (correct way)	7. T-junction to	Optional	1			
F5_P2	W1	O	Pause: wrong way (straight ahead)	8. Straight corridor	Absolute	1			
		R	Pause: asks where to go, prompted	4. T-junction	Optional	1	2	W3 reverse to W1 & W2	
			Pause: garden window	7. Straight corridor	Absolute	1		T-junction and central area	
	W2	O	Pause: shop front	4. Straight corridor	Absolute	1	2		
		R	Pause: looks where to sit	8. Central area	Optional	1			
			Pause: comments on shops	3. Straight corridor	Absolute	1	1		
	W3	O	Pause: garden window	3. Straight corridor	Absolute	1	1		
		R	Pause: decide which way	2. Central area	Optional	1	2	Circuit corner	
			Pause: reminiscence room	5. Circuit corner	Absolute	1	3		
F5_P3	W1	O	Pause: garden window	2. Circuit corner	Absolute	1			
		R	Pause: asks R for confirmation	4. Straight corridor	Absolute	1			
			Pause: garden window	3. Straight corridor	Absolute	1	2		
	W2	O	Slows down	5. Straight corridor	Absolute	1	3		
		R	Pause: garden window	4. Straight corridor	Absolute	1			
			Pause: garden window (plant)	5. Straight corridor	Absolute	1			
	W3	O	Pause: placard	10. Straight corridor	Absolute	1			
		R	Pause: speaks to R	2. Circuit corner	Absolute	1	3		
			Pause: complains of sore leg	4. Straight corridor	Absolute	1			
F5_P4	W1	O	Pause: asks where to go, then sit down.	11. Central area	Optional	1			
		R	Pause: asks which way.	1. Central area	Optional	1	3	Misses cue (continues on corner)	
			Pause: asks if they have to walk far (tired)	5. Circuit corner	Absolute	1		Too tired to continue	
	W2	O	Pause: wrong way (continues on)	9. Circuit corner	Absolute	1			
		R	X	X	X	X	X		
			X	X	X	X	X		
	W3	O	X	X	X	X	X		
		R	X	X	X	X	X		
			X	X	X	X	X		
F5_P5	W1	O	None	N/A	N/A	N/A	0	Return journey is problematic	
		R	Pause: Junction to wing, prompted	7. Straight corridor	Optional	1			
			None	N/A	N/A	N/A	0	Junction to wing cue (easily missed)	
	W2	O	Pause: Junction to wing, asks & prompted	7. Straight corridor	Optional	1			
		R	None	N/A	N/A	N/A	0		
			Break	4. Central area	Optional	1	1	Improved on W3	
	W3	O							
		R							
F5_P6	W1	O	Pause: asks R to walk on LHS	2. Circuit corner	Optional	1	2	Identifies wing after pause	
		R	Pause: asks R if they want to see room	5. Straight corridor	Optional	1	3	Knows their room	
			Pause: bedroom door (go into show R)	6. Straight corridor	Optional	1			
	W2	O	Break: lock bedroom door	7. Straight corridor	Absolute	1			
		R	Pause: outside destination	9. Circuit corner	Optional	1		Circuit corner is an issue	
			Pause: asks, R confirms they are correct	2. Circuit corner	Optional	1	1		
	W3	O	Pause: lifts leaf off ground (cleaner)	4. Straight corridor	Absolute	1	2		
		R	Pause: at double doors (let cleaner past)	7. Straight corridor	Absolute	1			
			X	X	X	X	X		

Table 5-12: Data sheet for F5 showing types of issues experienced during the walks and how often they occurred.

Wayfinding Walks

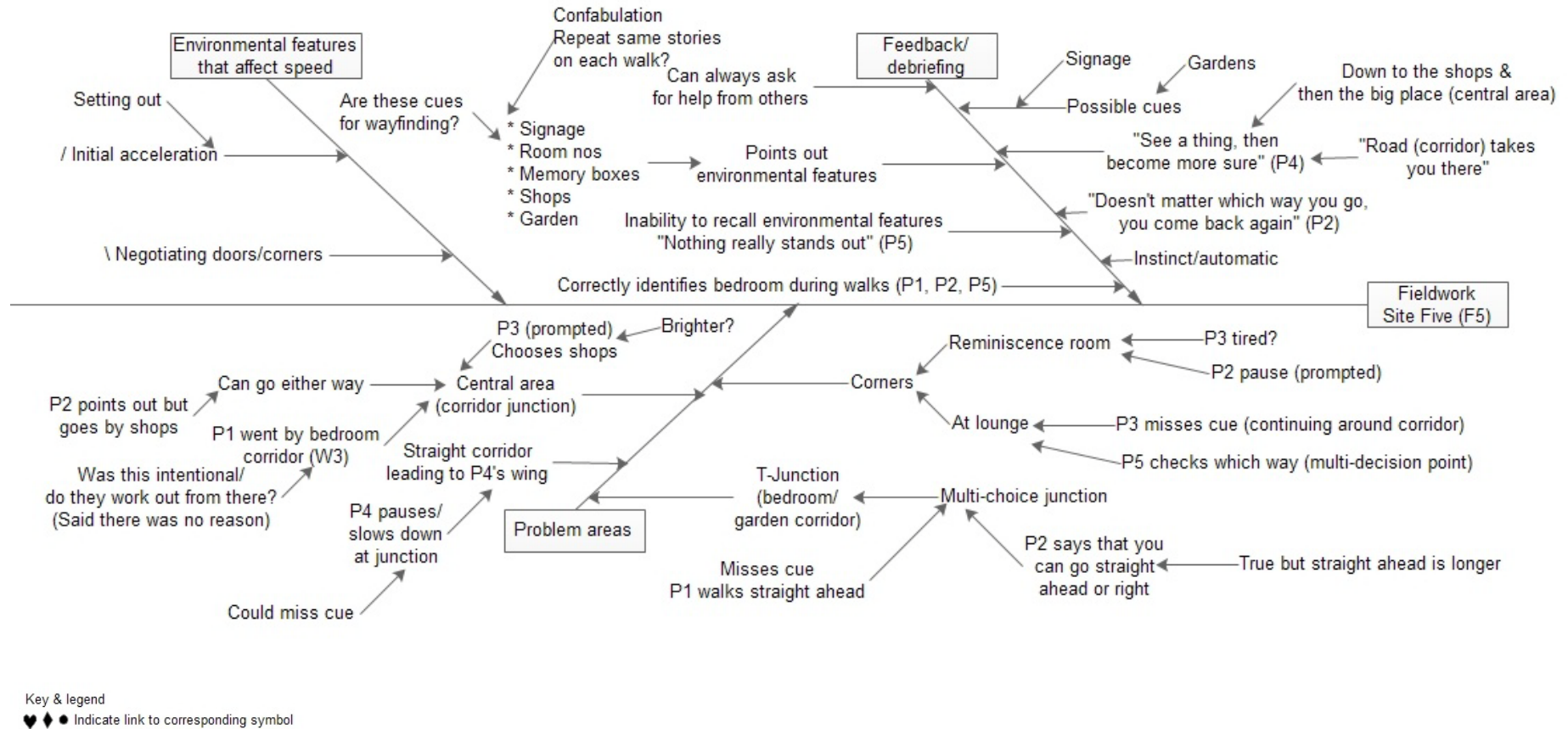


Figure 5-32: Summary of themes found presented as a cause and effect diagram from walks conducted at fieldwork site five.

Wayfinding Walks

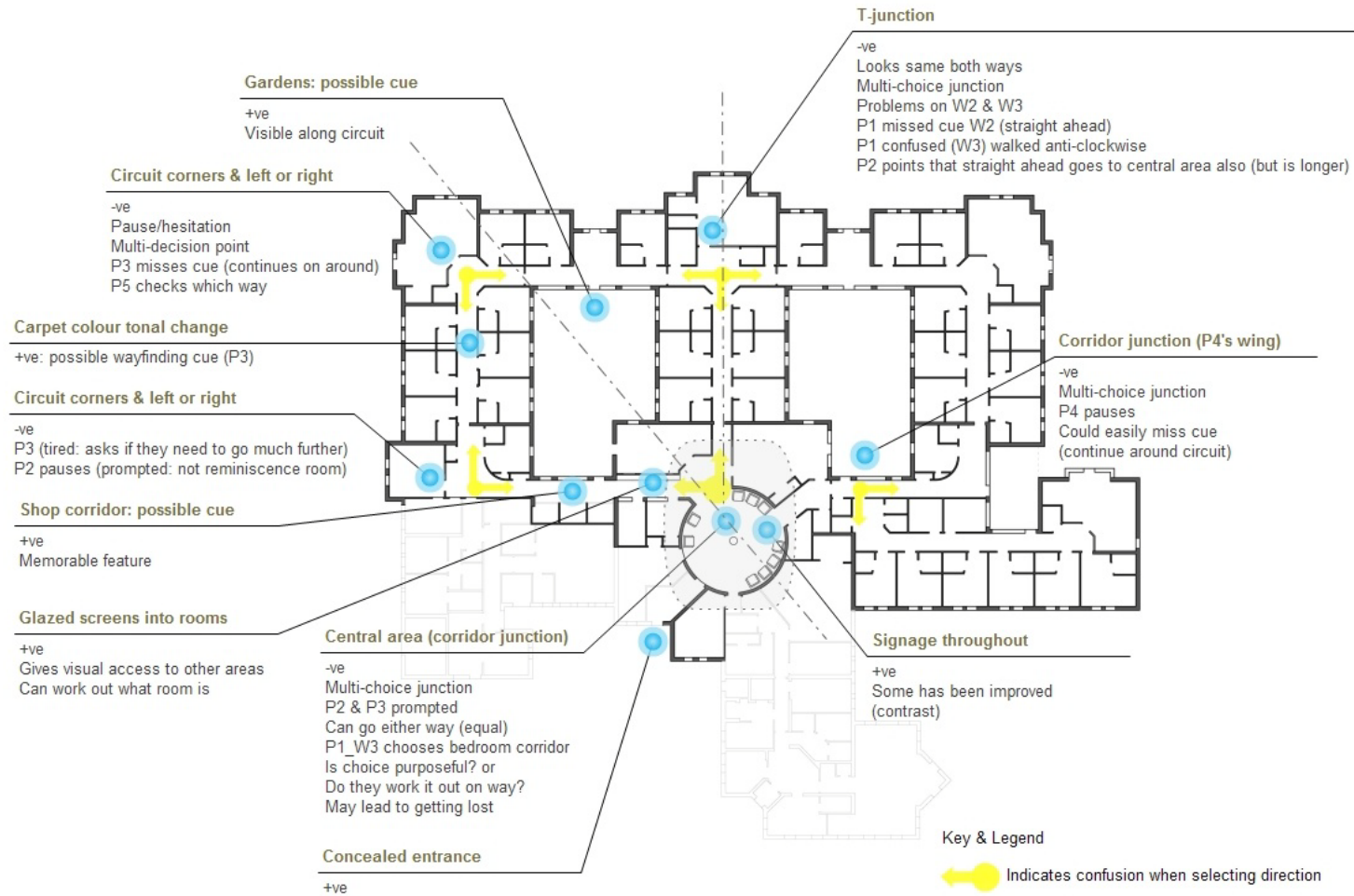







Figure 5-33: Summary of wayfinding issues for fieldwork site five.

Table 5-13: Summary of findings from the wayfinding walks




Wayfinding Walks

Environmental features	Synthesis		Implication/conclusion
	Cause	Effect	
(At start)	Setting out speed	/ Initial acceleration	Expected feature of the walks.
Obstacles: · Doors · Corners · Giving way to someone · Narrow corridors	Negotiating obstacles	\ Reduced speed	<ul style="list-style-type: none"> · Provide adequate space for manoeuvring (including with multiple walking aids, wheelchairs, trolleys and other equipment) · Avoid doors where possible (especially locked doors) <i>Conflicts with fire safety regulations (automatic sensors?)</i> · Avoid corners and kinks in corridors (these create obstacles) ·
Straight sections of corridors	Repetitive, identical doors and lack of features which may serve as distractions.	/ Acceleration	<ul style="list-style-type: none"> · If resident's bedroom is located along homogenous corridor it could be easily overlooked (<i>automatic sensors?</i>) · Straight corridor causes acceleration due to lack of features (focus is on walking straight) · Need to stand out/highlight areas which are important to residents ·
Central area <i>In these homes:</i> <i>F2, F3, F5</i> <i>Affected participants:</i> <i>F2_P2, F2_P4</i> <i>F3_P1, F3_P2, F3_P3,</i> <i>F3_P4, F5_P1, F5_P2,</i> <i>F5_P3, F5_P5</i>	Symmetry/mirroring <i>(looks the same in all directions)</i> Multiple choice junction	Wrong direction (opposite way). P asks which way to go. Pause/slow down.	<ul style="list-style-type: none"> · Too many direction/junction choices · Reduce number of decisions · Make each decision/junction obviously distinct from others · Avoid symmetry/mirroring (causes areas to look the same) 
Seating layout (F2)	Central area used as lounge as well as circulation space.	Seating layout determines and restricts directions of movement to the perimeter of the area.	<p>A large central seating area was put in place for monitoring and to create a hub. The impact of this has restricted freedom of movement in this area.</p> 




Wayfinding Walks

Environmental features	Synthesis		Implication/conclusion
	Cause	Effect	
Loud TV/alarms (F2 & F3)	Loud noises	Causes disorientation/serves as a distraction. Anxiety (F3_P4).	<ul style="list-style-type: none"> Control sensory stimulus (reduce noise) F2's central area serves as main circulation area (TV is watched here also). F3_P4 missed cue at T-junction and became disorientated in central area following an alarm. 
Central area junctions to corridors (F5)	Multiple-junction choices	Pause/ask for prompt "Which way?" Most people except F5_P1_W3_O choose shop corridor over bedroom corridor.	<ul style="list-style-type: none"> Two choices (both lead to same place but is this known?) Shop corridor is more appealing to walk down due to interest in the shop fronts, sensory stimulation, natural light and views to the cafe and garden. Is the choice to go left (shops) or right (bedroom) conscious/habitual/by chance? See walks with F5_P1, F5_P2, F5_P3, & F5_P5. 
Entrance is conspicuous in central area (F3)	Entrance opens directly onto foyer which doubles up as a central area.	Wanting out.	<p>This specifically affected F3_P4 on W2 and W3 which they led. During these walks they seemed more anxious and expressed that they wanted to go home, especially when they were in the central area.</p> 




Wayfinding Walks

Environmental features	Synthesis		Implication/conclusion
	Cause	Effect	
Dead-end (F2_P4)	Walks to end and looks out to fire exit and asks what is down there.	Questions why they are not allowed further (could lead to anxiety).	F2_P4 wanted to know what was there. Dead-end should be avoided as they lead to nowhere and if locked like in F2, it makes areas seem out of bounds/restricted. 
Kinks/geometry shifts in corridor (F2)	Looks like dead-end from a distance. Geometry in plan creates a corner.	Looks straight at it. “There’s nothing down there” (F2_P4).	<ul style="list-style-type: none"> · Kinks or geometry shifts in straight corridors can restrict visual access to areas causing difficulty with monitoring and wayfinding. This should therefore be avoided. · Wallpaper on corridor wall same as in Parlour (confusing)? 
Locked doors (on straight corridors in F3)	Management issue: separation of two units in F3.	Reduced speed on approach to closed doors from straight corridor.	<ul style="list-style-type: none"> · In this home it serves as an advantage as many of the residents would “cross-over” to the other side. This was noted during the observations in all residents who experienced difficulty in selecting which direction to move in the symmetrical central area. · Doors are painted in the same manner as the adjacent walls so could be perceived as a dead-end, hence the reduction in speed. 




Wayfinding Walks

Environmental features	Synthesis		Implication/conclusion
	Cause	Effect	
<p>T-junctions (All homes F2, F3, F4, F5)</p>	<p>Multiple-choice junction. Looks same each way.</p>	<p>Slows/pauses Checks/asks for a prompt (F3_P1, F3_P2, F5_P1, F5_P2) Takes some time to work it out themselves (F3_P3) Selects wrong way (F3_P4, F4_P1)</p>	<ul style="list-style-type: none"> · Doubt in which direction to go (looks the same each way) · Symmetry/mirroring · Missed cue and walks straight ahead (F3_P4, F5_P1). · F5_P1 claims it is possible to go either way. This is true but the other way would have been considerably longer (knowledge or confabulation)? · Lack of focus/conscious decisions (F3_P4, F4_P1). Walk in a direction by chance, ie. not planned. 
<p>Circuit corners (F5)</p>	<p>Multi-decision point. Continuous corridor</p>	<p>Cues missed. Continue around corner.</p>	<ul style="list-style-type: none"> · If a location is on the corner make the presence of it obvious 
<p>Signage</p>	<p>Demarcates rooms, areas and may point out where to go.</p>	<p>Assists in wayfinding or correctly identifying places.</p>	<ul style="list-style-type: none"> · F5 had named corridors and areas after local streets or squares to assist with wayfinding. F5_P1 and F5_P2 explained this was a good thing as they “mean something to you.” · Font and colour contrast had been changed on the new signage. · Pictograms were used along with text. 



Wayfinding Walks

Environmental features	Synthesis		Implication/conclusion
	Cause	Effect	
Room numbers (<i>signage for corridors</i>)	Door numbers on resident's bedrooms	Many residents were able to recall their room number or point it out during the walk.	<ul style="list-style-type: none"> · F5_P5 knew their room was number three and carried their own key with a key fob attached which had "3" on it. Was this part of how they knew? F5_P5's next of kin claimed this helped. · F3_P1 referred to the number of an old address when talking about their room number. This was incorrect and could have potential to cause confusion. Therefore, it is perhaps best to have a number which is relevant to the residents. 
Signs are too high <i>F2</i>	Signage above doors or at a high level.	F2_P4 that signage was too high and was not noticed.	<p>Place signage at eye-level so they may be seen.</p> <p>Many homes have undergone upgrading signage (easier to see).</p> 
Glazed screens/windows (Views within and out of building) <i>F5</i>	Provides visual connection.	<p>Allows people to see in to other rooms or to the outside.</p> <p>Orientation in relation to other parts.</p>	<ul style="list-style-type: none"> · Visual clues in advance, ie. before reaching/entering room. · If purpose of room is evident/clearly defined it can make it easier to identify. · Glazed screens were used in F5 and offered glimpses through rooms and to the outside. · Probably best to define it a glass within a frame, ie. if it were floor to ceiling glass it could appear as an aperture (residents might bump into it). 


Wayfinding Walks

Environmental features	Synthesis		Implication/conclusion
	Cause	Effect	
Adjacent bathroom (uses) <i>F2_P1</i>	Uses bathroom beside parlour to get their dressings changed.	Knows that Parlour is next to it.	<p>F2_P1's memory of using the bathroom adjacent to the Parlour provides them with wayfinding knowledge.</p> <p>Bathroom door is differentiated from other doors (recessed from corridor).</p> 
Sensory information (remembers baking & activities)	Activities which have taken place in certain rooms.	Remembers/recalls the activity and connects it to the place.	<p>Instilled memory of place may help to improve wayfinding. It can be learned from this.</p>
Decor: furniture & antiques <i>(F2 & F5)</i>	Contents and decor are distinct to a room/place	Able to connect contents of a room to a place	<p>Able to identify a room because of the contents (identity)</p> 
Murals/art work <i>(F2, F3)</i>	Themed corridor with 2D painted murals or 3D objects on walls.	Allows residents to interact with walls (sensory stimulation)	<p>It was noticed that these were looked at as participants walked along corridors, although these were not mentioned during debriefing, they may act as wayfinding cues.</p> 

Wayfinding Walks

Environmental features	Synthesis		Implication/conclusion
	Cause	Effect	
Gardens (F5)	Secure courtyard garden visible at many points in the building.	Recalls garden based on activity and views visible when walking around F5.	<ul style="list-style-type: none"> · F2_P4 expressed how they would like a garden · F5 had the most freely accessible, secure garden and was pointed out by many of the participants during the walk. · F5_P1 and F5_P2 mentioned the garden during debriefing as something which stood out (could be a potential wayfinding cue). 
Shop fronts (F5)	Corridor with themed but active shops which appeal to the senses.	Interacts and recalls shop fronts and associated activity.	<p>Possible wayfinding cue in F5. Many participants mentioned this during debriefing.</p> 

Wayfinding Walks

Environmental features	Synthesis		· Implication/conclusion
	Cause	Effect	
Memory boxes (F5)	Wall mounted boxes filled with personal contents displayed outside resident's rooms.	Able to identify room from personal contents inside.	<ul style="list-style-type: none"> · Verdict is inconclusive as there were some conflicting views. · Ideally displayed at eye-level. · But: protrude from wall so they can be seen (risk of bumping head) · Why not recess them so they are flush with the wall? F5 identified this and tried in a new home built by the same care provider, however it was observed that these were not noticed by residents. · Some residents in other homes pointed at their room number or a picture which they could identify as themselves displayed on the door. The impact of the numbers of flat pictures on the doors might be as effective as memory boxes. · One resident in F5 was described as using confabulation techniques and disliked anything which would identify them as having dementia. It was therefore their wish not to display anything in their memory box which they could be identified by. 

Key & Legend

	Common issues
	Issues relating to the central area
	Issues relating to corridors
	Issues relating to junctions
	Possible wayfinding cues

5.4 Wayfinding walks: a summary of findings and conclusions

5.4.1 Summary

Common issues

It became evident that there were common issues which were a feature in all homes that would affect the speed of participants during the wayfinding walks. These included an initial acceleration at the start of the walks which can be explained from setting out. This is to be expected and does not necessarily indicate that the participant is being influenced positively from the physical environment in terms of wayfinding cues. Other factors which caused fluctuation in speed were straight, uninterrupted sections of corridors which generally caused an increase in participant's speed. Many of these corridors in the homes are homogenous, with repetitive, identical doors and a lack of features. While the limited distractions seem to increase speed on these corridors, this may be problematic if there is something along the corridor which is a desired destination for the residents (for instance their own bedroom) as they may be inclined to overlook it. It may therefore be necessary to highlight specific areas or provide obvious wayfinding cues to avoid residents from missing their required destinations. Conversely, in areas where there were obstacles that resulted in a reduced speed. Obstacles included: doors, corners, narrow corridors or giving way to someone. The reduced speed can be explained by the need to negotiate or manoeuvre around these objects. Even in some of the homes which have wide corridors, space soon becomes insufficient when multiple walking aids, wheelchairs, trolleys and other equipment are used in the home. Corners and kinks in corridors should be avoided as they pose as barriers. Doors, especially those which are kept closed should also be kept to a minimum. Although it is appreciated that this may cause issues with fire safety regulations. Some of these common issues are debated in further details as they pose as an issue relating to layout.

Layout considerations

Corridor design was noted to affect wayfinding, particularly when there was a dead-end or kink in the corridor because of a shift in geometry. Sometimes locked doors were placed along corridors and although concealed to appear as a wall, it was likely that they were perceived as a dead-end. This causes difficulty in wayfinding because it restricts visual connection and limits access, making areas seem out of bounds.

Central areas, such as those in F2, F3 and F5 created difficulty because of the mirroring within the plan and caused participants to select the wrong direction. In many cases, reaching the central area was less of an issue but when exiting it to go to other parts, then it could be seen that the multiple choice of junctions was causing difficulty. In F5 where each of the junctions were signposted and made to look different, there was still some hesitation and confusion seen at the shop/bedroom corridor junction in F5_P1, F5_P2, F5_P3 and F5_P5. Most of these residents chose to go via the shops, perhaps because it offered more natural light, views within and outside of the building and sensory stimulation. The central area in F2 was used as a seating area where residents watch TV. The layout of the seating in this area restricts movement to the perimeter of the room and may have caused residents such as F2_P4 to select the wrong course of path. The loud TV in F2 and the alarm sounding during F3_P4_W2 may have caused disorientation in the central area, explaining why wrong directions were selected. In F3_P1, problems of mirroring were manifest when F3_P1 repeatedly wanted to go in the opposite direction in the central area as they were convinced their room was on the other side. Another issue in the central area of F3 is the fact that the entrance door is obvious and directly accessible from here. This and the alarm, along with the role of leading the walks were probable causes of F3_P4's agitation during walks two and three. During these walks F3_P4 expressed that they wanted out, particularly in the central area where the entrance doors can be seen.

Junctions were noted to cause difficulty during the walk, slow participants down or cause them to pause and ask for help on where to go. In F5 the corners of the circuit part of the plan caused F5_P5 to stall and ask which way to go while F5_P3 continued walking around the corner, missing the cue to enter their destination of the lounge. T-junctions were troublesome and this was seen in all homes. At these T-junctions, once again there is a multiple choice junction and each way looks similar so it is understandable that some participants were doubtful about which way to go.

Possible wayfinding cues

Signage was mentioned by some residents as something which helps them to know where they are going. Participants in F5 commended the use of local names with F5_P1 stating "they mean something to you, you know?" Also significant were room numbers where several participants were able to correctly recall their own room number. In the case of F5_P5, his next of kin believed this may have been helped by holding his own key with a fob reading "3". There may be some evidence that it

could be more meaningful to use a previous address for resident's rooms as F3_P1 correctly recalled his old house number but this caused confusion as he would now look for that number instead of his correct and different room number in F3. Feedback from F2_P4 was that many of the signs were too high and therefore were not noticed by anyone (in F2 the signs tend to be placed above doors to demarcate areas). This supports the proposal that signs should be placed at eye level or lower so that it can be seen (older people's posture changes and with this their field of vision lowers).

Glazed screens in F5 offered views within and to the outside of the building. Features which were mentioned during debriefing and were considered to stand out were the gardens and shop fronts. These may have been used as wayfinding cues during the walks to determine where one is in relation to these features. Decor and antiques were mentioned as indicators of arriving at the destination (Parlour) in F2 by F2_P1 and F2_P4 who believed these to be distinct features in this room.

Knowledge of the surroundings of the parlour was used by F2_P1 who pointed out that they knew the adjacent bathroom to the Parlour because they got their dressings changed there and this helped them to find the destination. Sensory information in the form of smell was mentioned by F2_P3 and F2_P4 who said they knew respectively where the dining room was because of the smell and where the Parlour was because they remember the baking.

The benefits of the carpet colour change for F5_P3 was seen when they said they knew where they were when they entered the green zone of the carpet. This was something that their next of kin had mentioned during debriefing. Care must be taken regarding changes in floor colour or surfaces, however in F5 it may be successful as the tonal difference is not enough to be perceived as a step.

Other more questionable wayfinding cues are murals/art work and the memory boxes. In the case of the memory boxes there were some conflicting views whether this was any better than flat pictures and numbers displayed on the doors of residents. Most residents pointed out or referred to their room number rather than their memory box. Other issues regarding memory boxes related to the need for them to protrude from the wall at eye level to be seen but this consequently posed a hazard of bumping heads and that residents who prefer to be more private did not like to be identified by the box outside their room.

During the walks, it was noticed that art work and murals were looked at, however this was not mentioned during debriefing. Therefore it was not determined whether art work and murals are used as wayfinding cues.

Please refer to Table 5-13: Summary of findings from the wayfinding walks for further detail.

5.4.2 Conclusions

Supporting observed empirical evidence emerged throughout the wayfinding walks which concurred with views of staff or next of kin expressed during the interviews. This included avoiding dead-ends or locked doors and using signage which related to the local context and gives residents an address or number on their door. Areas of glazing were useful in providing glimpses to other parts, this was particularly successful in F5. Subtle changes in carpet colour (but not tone) were used by F5_P3 who knew they had returned to their area when they could see the green carpet. This worked for one of the participants in F5 but it is debateable whether this is significant to others as colour becomes increasingly difficult to distinguish with age.

The success of the layout of F5 was seen which follows a double circuit plan (figure of eight), connected by a large central circular, high level ceiling and clerestory lit space. This layout provides residents with a hierarchy of space and seemingly gives them access to all areas by cleverly concealing staff only areas and entrance doors. The circuit plan which was spoken about positively in many of the interviews with staff and next of kin from other homes is not without its problems. Interviewees shared the premise that a compact, circuit type plan which had a central area was ideal. However as it presents a variety of junctions and can encourage walking around corners, residents may miss wayfinding cues to certain areas if they are not obvious enough. The circuit of F5 does have the benefit of allowing residents to walk either way and end up in the same place but it was difficult to determine whether choice of direction was purposeful or haphazard which could lead to getting lost (see the case of F5_P1_W3).

This chapter explained the processes and methodology of the wayfinding tasks. It presented the findings which emerged from the walks and the briefing and debriefing sessions conducted for each of the four case study sites. Chapter 6 follows on from this, discussing findings from the interviews and wayfinding task and synthesises recommendations and considerations for architects.

Chapter 6: Discussion and Recommendations

6.1 Introduction

This chapter will discuss the findings of this thesis. As a result of the research conducted, including the interviews and wayfinding walks, design recommendations have emerged. These have been organised into four domains which include environmental and management implications and are defined as follows:

- **Architectural domain:**

The architectural domain is concerned with the layout and design of the physical environment and is considered to be an overlooked area when examining how design supports wayfinding for dementia.

- **Interior architecture domain:**

This domain reports on features of the interior design and the impact on wayfinding for people with dementia.

- **Personalisation domain:**

Relates to how the space is used and personalised for and by the individual residents.

- **Management and care domain:**

Although this area is not directly related to design and architecture, there is a strong link between the social care environment and the physical environment. The findings from this area are relevant either during the design process or in the general day-to-day management of care for residents.

6.2 Discussion of findings from interviews

Four overarching themes emerged from interviews conducted with staff from the homes and associated next of kin who participated in the wayfinding walks. Many views were shared between staff and next of kin and in some cases giving complementary information, relating to a particular issue. This section will discuss these findings from the themes (activities, management and care issues, design issues, wayfinding specific issues) and explore anomalies and implications of this in relation to design for dementia.

6.2.1 Architectural domain

Layout: create a hub for monitoring, activities and provide access to outside

Staff and next of kin agreed that a large, central hub with smaller adjacent places was useful in providing a range of spaces to provide for group activities or quieter one-to-one sessions. It was a common thought that outdoor spaces were overlooked and that there were missed opportunities from a design point of view which has rendered garden access impossible or difficult to monitor, thus denying residents the basic right of accessing outdoor space. Outdoor spaces should be easily and freely accessible, provide shelter and shade with particular reference to the micro-climate and suitable lighting for evening or winter access. These elements are highly relevant to the layout and hierarchy of spaces in the building. These issues are considerations within the architectural domain.

Simplicity is key for wayfinding

The architectural layout should be simple, avoiding lifts, stairs, locked doors, dead-ends and where possible, eliminating junctions or corners. Some interviewees noted that symmetry or mirroring also causes confusion as residents cross over to the wrong side, so it may be important to avoid symmetry in the architectural plan. These elements of architectural design ultimately simplify routes within the building and help to support wayfinding.

Clearly defined spaces, not multi-purpose

There is a general feeling from next of kin that facilities could be better to support activities and that it was not ideal to 'double up' purposes of rooms because it can be confusing for the resident as the areas become undefined. Although activities appear to be a social care and management issue, staff explained that it must be considered at the design stage to provide adequate facilities, spaces and a supportive layout which will enhance the experience for residents.

Avoid lifts, stairs, locked doors, dead-ends and long narrow corridors

Next of kin placed an emphasis on the need for dementia accommodation to be on ground floor level. This issue was shared by some staff as it was felt that stairs and lifts can cause confusion and disorientation. They also felt that the home should provide a sense of freedom with no areas 'off limits' and avoid dead-ends or locked doors. In connection to this, it was recommended by staff that the plan should be compact and simple, avoiding long, narrow corridors.

As an implication of this, it may be necessary to reduce the number of people in the home or separate numbers into smaller units or clusters as part of one large home. This would also help with monitoring issues mentioned in Section 6.2.4.

Site selection and planning issues

Staff and next of kin agreed that design for dementia has a potential to benefit more than just those with the disease. As mentioned earlier, gardens are overlooked in terms of provision and access, but also in terms of the actual design or theme, that is to say whether it is a sensory garden or practical planting or seated area. Both types of interviewee discussed planning and site selection, whereby local services (such as bus routes, pharmacies and GP surgeries) should already exist and the community should be supportive in that the scheme is integrated. With reference to this and of particular relevance to Northern Ireland, the site selection should not discriminate against any potential residents within the catchment area or be polarised towards any political persuasion. The design of the homes and the ambience were seen as important factors in encouraging visitors to the home. Site selection is also important so that the home is convenient and well located in terms of accessibility to outsiders.

A lack of expertise in design

Concerns were raised regarding specificity of design for dementia, this time regarding the lack of staff/carer input in the design process and absence of knowledge displayed in the designers' response. In the case of one home, a manager even described how the home was referred to as 'purpose-built' and considered 'gold star.' Though there were many design flaws or overlooked items, even regarding cost neutral issues, such as colour and toilet seats which were wrongly specified and consequently had to be changed at an early stage causing great expense to the home. Another home explained that re-categorisation can sometimes be at the heart of the problem, where a general nursing home has changed to cater for the needs of those with dementia in order to meet the high demand for care, although the care may have changed, the building is not dementia specific.

6.2.2 Interior architecture domain

Light, internal and external views and function of rooms are obvious

Home design should incorporate high levels of natural light, provide sufficient levels of lighting which caters for the ageing eye and visual impairment, whilst avoiding glare. Views inside and out of the building were considered important as they can provide glimpses into spaces and help with orientation and potentially improve wayfinding as they provide clues about one's whereabouts in relation to the rest of the building, particularly if the function of a room is made explicit. In connection to this, next of kin highlighted that it was best to avoid an open plan layout. Although this is probably more specific to smaller scale, domestic property, the rationale behind this relates to the need to clearly define areas and spaces and their purpose.

Improvements: redecoration, refurbishment and space for personalisation

Design improvements were made over the life time of the homes and in some cases this involved experimentation to determine whether features were effective for the clientele. Due to the cost of these upgrades, this normally means that if something is not working the homes will only be able to amend it next time they are undergoing refurbishment. Mixed views were expressed by staff regarding flooring materials, with most people preferring linoleum type flooring which was smooth, easily maintained and cleaned and easier to mobilise on and less likely to cause trips. This was opposed by one home manager who felt that carpet was more homely. This conflict brought in the case for personal choice and whether homeliness was more preferential over easy maintenance, cleaning and mobilisation. Considering these issues, it is probably best to avoid carpet as it seems the disadvantages outweigh the advantages. Homeliness was another topic under discussion by staff who raised the point that it was very difficult to personalise a room if it is too small and it should accommodate different types of furniture, including bed sizes to cater for a variety of preferences.

Features of interior design that support wayfinding

Signage was recognised as having a role in promoting orientation. There was some debate about the relevance of some signage and it was recommended that relevant names or addresses were used and text should be accompanied by imagery. The use of bold colours to provide an easily recognised sign was also identified and this should help to differentiate the elements of the sign.

Although the issue of the use of colour for people with dementia is less considered due to the degeneration of eyesight, there was some suggestion that this assisted some people, particularly one lady in F5 who knew she was close to her living quarters when she saw the colour of the carpet on the floor change to green. Perhaps this was useful for her, but not everyone might notice this. There is also the danger that changing the colour on the floor might produce a tonal difference which could be perceived as a step, rather than indicating a zone of the building. Tone was recognised as important in demarcating spaces, so it was reported that there is a definite need to have an adequate contrast between both the handrail and walls and the walls and floor.

The verdict was inconclusive on memory boxes and they posed a risk of head injury to residents as they would walk past with a stooped posture. The predicament with this is they need to be at around eye level so they can be seen and if they are recessed they are less likely to be seen. Another consideration is the dignity of the residents. In some cases residents articulated that they did not like having things of theirs on show and wished to have nothing in their memory box outside their room out of respect to their privacy. This was of course respected, but it rendered the memory box useless.

6.2.3 Personalisation domain

Freedom of movement, sensory stimulation and affordances

Next of kin discussed a range of design issues, including allowing freedom of movement and avoiding locked doors and favoured under-floor heating as it presents fewer obstacles and is more comfortable. In terms of interior design, they felt that sensory stimulation was necessary but should be at a controlled level and that there should be a variety of seating options available, similar to activities, to provide for group or one-to-one needs. Affordances were also mentioned in relation to how easy the environment was to use, an example was door handles were preferential to door knobs as they were easier to use.

Activities: they might not remember them, but it has put them in a good mood

The benefits of activities were widely recognised as having a high significance to the wellbeing of the person with dementia. Next of kin explained that even if the resident was unable to recall what they had been involved in, they felt if they had enjoyed it, they would be in a good mood after it, so this made the effort worthwhile. Staff complemented this by explaining that it was important to find activities that were inclusive and are appropriate to each of the individual's needs and accept that not everyone will want to participate in group activities.

Wayfinding: inability and instinct

There was the realisation that some people did not have the capability to independently find their way and that they needed to rely on others to either assist them or take them there. On the other hand, some people spoke about wayfinding as instinctive and once a person was settled in and a routine was established, they would be less anxious and more familiar with their environment and the routes in the homes, thus orientation was improved or learned.

6.2.4 Management and care issues

The need for monitoring and greater care

A major reason for moving into a care home discussed by next of kin was linked to needing additional support and better monitoring to keep their loved one safe. Staff shared this view and highlighted that in order for monitoring to be successful, the physical environment should ideally be small, compact, safe and provide security. Staff ratio was also an influential factor on improving the care experience and reducing carer burden and improve staff retention. They also explained it is not an easy decision to make and there is likely to be feelings of guilt associated with the culture shock of moving in. Both types of interviewee appreciated that routine was important and that next of kin have a role to play in informing a better person-centred care which would incorporate life stories to inform activities and methods of dealing with challenging behaviour. Staff also described how they cater their care for individuals by considering the extreme cases, so that the varying degrees of cognitive function are accommodated for in activities and vice versa.

The challenge with future proofing and flexibility

Staff recognised the importance of design in supporting care specifically for people with dementia. Shortcomings were reported that design was often orientated towards general nursing care so was not suitable. Future proofing design and enabling flexibility were also relevant issues in relation to changing expectations of what a home is, in particular what type of facilities should be provided, space standards and challenges such as accommodating couples and younger people with dementia. It is a simple statement to make regarding 'future proof' design that allows for flexibility, but it is not an easy thing to achieve. To overcome part of this, better space standards may be incorporated, however, this is dependent on available budget. One of the greatest challenges reported was the increase in young people with dementia and the associated expectations regarding space standards and facilities to respond to mobility needs, such as gyms.

Creating a greater sense of community within the design may assist in creating a more natural environment where the resident's home or flatlet is a small element in a form of a townscape.

Avoid moving in the home: ageing-in-place

The legislation relating to care within the home should avoid moving the person, if for instance they require more care as this can cause stress and disruption. In one home they described how they zoned dependencies so that those requiring greater monitoring were located closer to staff areas in response to their need, but the flaw with this means that with residents' decline, inevitably they are likely to be upset with being moved. The design of the building must therefore offer equitable monitoring to all areas to ensure ageing-in-place in the resident's room, eliminating the need to move closer to staff.

6.3 Discussion of results from Space Syntax with reference to the wayfinding walks

As part of the triangulation of methods, Space Syntax was used as a comparative method to predict how space would be used and how it impacts on wayfinding. Visibility Graph Analysis analysed the space in terms of the visibility of the architectural plan. This can therefore highlight how legible the spaces are and highlight areas which may support or hinder wayfinding. Avatar based analysis was also used to predict movement, both this and VGA simulate human behaviour in space. However it is necessary to verify this with the reality of the wayfinding walks.

A manual spectrum was created based on each participant's performance during the wayfinding tasks (Section 5.3). This was intended as a comparison to the spectrum produced as a result of the avatar based analysis which can predict human movement in space. The avatars in Space Syntax analysis mimic human behaviour (stopping or pausing) and it is assumed that movement is purposive and that they possess perfect knowledge of their environment. The implication of this is that if a person has dementia, their movement can be purposive but their perception of the physical environment is altered, so "perfect knowledge" may not exist. It may therefore be necessary to programme an alternative avatar which would be designed based on a person with dementia or someone who is less familiar with the environment to accurately predict movement and how incidences of getting lost is affected.

Generally the results from the VGA did not correlate for the participants with dementia during their wayfinding tasks. In fact, the exact opposite was more likely to apply. Normally where warm colours (red, orange and yellow) are shown on the VGA spectrum graph, this can be interpreted to support wayfinding as the space is shallow, legible and other areas of the building can be seen easily from this point. However it was observed that these areas of the building which were often large, central, open spaces caused difficulty for people with dementia, often due to the multiple decision point. There was some correlation seen with the avatar based analysis which sometimes accurately predicted the movement. Space Syntax can be a useful design tool for predicting how spaces will be used and read in terms of wayfinding. However for people with dementia the computer model may require a different level of interpretation or an alternative avatar programmed according to someone who has cognitive decline.

The findings from Space Syntax will now be discussed in relation to specific findings relating to the architectural domain in Section 6.4.1.

6.4 Discussion of results from wayfinding walks in relation to interviewee responses

Wayfinding based tasks were conducted with selected residents of the nursing or residential care homes. This was intended to incorporate an ethnographic or anthropological approach which would reveal an insight into the experience of residents with dementia. It elaborated on the responses from the interviews with staff, which also complemented the results from the wayfinding walks in addition to responses from next of kin. Briefing and debriefing were included as part of the wayfinding walks, providing participants with the opportunity to express their thoughts on the design of the home and point out areas which help or hinder wayfinding in the home. This method was an important tool for exploration, to record first hand experiences and involve the person with dementia in the research as a valuable contributor.

The results combined responses from the feedback from briefing/debriefing and observations from the wayfinding walks. Behavioural mapping was used to record the observations from the wayfinding walks and included the following data: distance, time, speed between points, point on plan, conversation and behavioural effect. This was then analysed and considered with the correlated graph, map, image from the Vicon Revue cameras and any alarms were highlighted to determine which areas of the environment were triggers to cause wayfinding issues or help promote orientation.

The remainder of this section details this synthesis, as well as considering interview responses and proposes implications and recommendations for designing for dementia. These design considerations were organised into the four domains: architectural, interior design, personalisation and management and care.

6.4.1 Architectural domain

The following principles relate to the design, layout and architecture of the physical environment. These consider interviewee responses, Space Syntax analysis (VGA and Avatar Based Analysis) as well as findings from the wayfinding walks.

Avoid long, straight corridors, with repetitive features

Long corridors are often present in nursing and residential care homes to provide accommodation or bedroom wings. The homogenous nature of these corridors means that personal bedrooms may be overlooked. The effect of these corridors caused participants to accelerate due to the lack of features which enabled them to focus on walking straight ahead. There is a case for doors to trigger when residents walk by so that they open automatically indicating that they belong to them. This technological feature may help, but there is a need to highlight individual ownership and maintain wayfinding capabilities. Plans and the architectural layout should be compact so that long, homogenous corridors may be avoided. The VGA results indicated that long sections of corridors were deep or less visually accessible, making these and rooms along them harder to find. This poses a problem since bedroom wings are often placed in this form, so it may be difficult for residents to find their way to their rooms. In addition to this, the avatar based analysis showed acceleration on sections of long, straight corridors, which may again cause rooms to be overlooked, particularly if there are repetitive or homogenous elements present. This corresponded with reality where participants tended to speed up and miss cues along repetitive corridors.

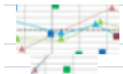

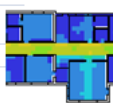
Graph	Alert!	Map	Image	VGA	Avatar	Environmental features
	Acceleration					Straight corridor

Table 6-1: An excerpt from F4_P1_W2 matrix at point 4 showing the effect of a long corridor and the results from VGA and avatar analysis.

The synthesis of this part of the walk shows acceleration due to the straight corridor and there is some evidence of focus on the walk as F4_P1 confirms with the researcher that they are walking the right way. The yellow/orange manual spectrum shown on the map corresponds with the avatar (acceleration). The image shows that the homogenous nature of the corridor means that cues could easily be missed.

The problem with central area junctions to corridors (symmetry)

This creates a multiple choice junction and caused most people to pause in doubt and ask which way they needed to go. It appeared that without prompting the more convenient or more attractive corridor was selected. For instance, in F5 when exiting the central area, most people chose to walk by the shop corridor (bright with direct window views to garden and active shops) rather than the bedroom corridor which was double banked and artificially lit. In F2 it seemed the most convenient corridor would be opted for.

The findings from the VGA analysis of central areas in F2, F3 and F5 was that these areas would normally support wayfinding as the warm colour indicates that the space is shallow and that there is good visibility to other parts of the building from this point. However, this acts as a disadvantage for people with dementia because it requires decision making and to choose from multiple directions. Table 6-2 shows how the central area was a problem in F2 and the avatar simulation indicates where there is mirroring or symmetry in a plan, this can cause confusion as it can promote crossing over. The implication for this is to reduce the number of junctions at any point, but particularly from the central area as this causes confusion and if the wrong decision is taken, the resident can end up lost on a corridor far from where they intended to go. Another consideration in F5 was where the two corridors which caused confusion (bedroom corridor or shop corridor), shared the same decision point and were close together. Although the two corridors looked distinctly different, this did not seem to matter and there did not seem to be a preference for choosing one corridor over the other, so the most convenient one appeared to be selected. This point was elaborated on in an interview with a next of kin who thought that if F5_P1 was left to their own devices they may choose the wrong way and have to work their way around the circuit and take the longer route.

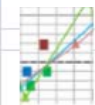


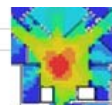

Graph	Alert!	Map	Image	VGA	Avatar	Environmental features
	Acceleration					Central seated area

Table 6-2: *An excerpt from the F2_P4_W3_O matrix at point 9 which illustrates the problems with a central area which has multiple decision points and symmetry of the plan.*

The problematic central area with its multiple decision junction is not unique to F2 as problems may also be seen in F3 and F5. F2_P4 experienced difficulty in the central area on a number of occasions, pausing or slowing down and sometimes used confabulation to cover up this. On this occasion they pointed out the bathroom when the researcher corrected their direction.

Entrances/exits are hidden

Entrances or exits which are obvious to residents, such as those opening directly onto shared space can cause distress as they may want to go out but are restricted as they need to be accompanied or in a secure space. Distress was witnessed in F3 when F3_P4 wanted out (Table 6-3).

The design implication is to create a hierarchy of spaces and avoid entrance/exit doors being in direct view or opening into a shared space.

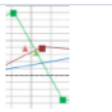
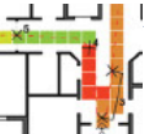
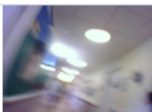
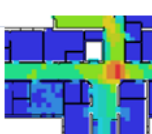
Graph	Alert!	Map	Image	VGA	Avatar	Environmental features
	Deceleration					Straight corridor (farm mural)

Table 6-3: Excerpt from F3_P4_W3_R matrix at point 5.

The obvious doors to the outside can be seen easily from the central area which serves as a foyer. This causes F3_P4 some distress and frustration that he not allowed out. Similar problems arise with dead-ends and locked doors which make areas out of bounds and do not promote free movement.

Avoid dead-ends

Dead-ends cause frustration as they can make areas feel out of bounds. It is somewhat similar to entrances/exits which are obvious as they create a feeling of restricted movement.

The implication is that if there are dead-ends, there should be a purposeful space. Dead-ends should ideally be avoided so that there is a sense of freedom to the movement in the space.

The problem with locked doors as control points

In F3 locked doors were used to separate two units. These were painted in the same manner as the walls so were intended to appear as concealed. This created a similar behavioural response to a dead-end and was problematic in this particular home as there was accommodation beyond this point, including the dining room which the residents needed access to.

While it is appreciated that this may be a useful design technique to use to disguise staff only areas, such as stores, sluice rooms and treatment rooms, it can make areas accessed from primary routes which are locked or closed off, feel prohibited, causing distress for the person with dementia.

Avoid kinks and geometry shifts in the plan

Kinks in corridors in F2 appeared like dead-ends, before the end of the corridor was reached. This unnecessary shift in geometry means that monitoring becomes difficult and visual access is restricted and the ends of the wings become less accessible because it appears as though there is nothing further there. Shifts in geometry should therefore be avoided.

Graph	Alert!	Map	Image	VGA	Avatar	Environmental features
	Acceleration					Straight corridor

Table 6-4: Excerpt from F2_P4_W3_R matrix at point 2 which illustrates the problems with a central area with multiple decision points.

P4 paused at point 2 to look their left at what a kink in the corridor which appears to be the end of the corridor. This acts as a distraction on other parts of their walks. They are aware there is something further along the corridor but explain they have never needed to walk that far.

T-junction issues (symmetry)

These present a multiple choice junction and similar to the central area junctions to corridors, there is doubt shown due to pauses and asking for prompts. Although sometimes there is ability evident when the participant found their way, this took extra time and more often participants selected the wrong way. Circuit plans (figure of eight) allow residents to go both ways and eventually end up where they need to be but this is tiresome. Wayfinding cues, such as signage might be useful in prompting people to take a turn, although it is best to avoid these type of junctions if possible.

The issue at the heart here is symmetry in the plan which should be avoided as things look similar in every direction so it is difficult for residents to make a choice.

Graph	Alert!	Map	Image	VGA	Avatar	Environmental features
	Deceleration					T-junction

Table 6-5: An excerpt from F3_P4_W2_O at point 4 where F3_P4 missed the right turn and is corrected in the right direction by the researcher.

Although the VGA is red at the T-junction which shows good visibility at this point, this poses a multi choice point making a difficult decision process for people with dementia. The avatar analysis supports what was witnessed during the walk in F3 with F3_P4 as there is a strong warm tone along the bedroom wing corridor (shown vertically) with a break to the right which may explain how the right turn was missed (Table 6-5).

Corners on circuits are problems

Corners of circuits seemed to encourage movement, so wayfinding cues such as the glazed screens and signage into the lounge were often missed and the destination was past. This is similar to the kinks in the corridors and supported by Marquardt (2011) who recognised the significance in providing good visual access which could be assisted by glazed screens. This was despite the lounge having a prominent position on the corner. It also acts as a multi-decision point when leaving the corner.

As a consequence, it is suggested that any accommodation located on a corner should be obvious.





Graph	Alert!	Map	Image	VGA	Avatar	Environmental features
	Deceleration					Corner outside living room (destination)

Table 6-6: An excerpt from F5_P3_W1_R at point 9 where F5_P3 missed their turn into the living room and continued to walk around the corner.

The VGA shows a warmer tonal colour on the corner suggesting good visibility, however many participants in F5 struggled with the symmetry at this point when leaving the living room when choosing which direction to go. Table 6-6 shows F5_P3 approaching the living room, however they continue to walk around the corner and miss the cue to turn left. The avatar analysis gives some support to this where the corner that leads past the garden has a slightly more used path (indicated in orange, warm tones).

Internal and external views assist with orientation

Glazed screens and windows offer internal and external views and provide a visual connection of where one is in relation to parts of the building. This knowledge can assist in wayfinding. If the purpose of a room is clearly defined then this can be seen and identified. It is probably best to place glass within a frame or aperture as opposed to having large expanses, or floor to ceiling glass as this might pose a hazard and cause people to bump into it.

There is a limitation with VGA and avatar analysis where the experience of glazed elements within the building cannot be seen.

Gardens are essential but poorly designed or overlooked

The provision of the basic right to safe, secure access to an outdoor space instils a sense of freedom. This issue is frequently overlooked and poorly catered for, even in rural sites where there is huge potential for creating a number of themed garden spaces. This must be at the heart of design and an integral feature within the design concept. Basic requirements are the provision of freely accessible, safe and secure access with shelter, shade and lighting specific to the micro-climate.

6.4.2 Interior architecture domain

The following recommendations relate to interior design, furniture and colour.

Avoid obstructions: seating layout, narrow corridors, doors, corners and kinks in corridors.

Where seating is placed will restrict movement. This is particularly true in more confined spaces such as narrow corridors. While these provide essential rest stops, care should be taken when deciding where these are placed. A more successful design will incorporate these within the layout of the building and consider this at the design stage, rather than an afterthought to resolve with furniture which can be moved around.

The implication is to provide generous circulation spaces to allow for manoeuvring of multiple walking aids, wheelchairs, trolleys and other furniture or equipment. This is something which should be considered during the design of the architectural layout of the building.

Signage: should be relevant and at the right level

Font, colour contrast (tone) and pictograms should be carefully considered so that signs are easily identifiable. The use of local addresses or numbers from previous addresses was viewed positively as they were more memorable and meaningful. Room numbers were sometimes confused with a previous address if the number of their room was less relevant. Room numbers were remembered by many of the participants and in the case of those who held their own key, a key fob with the number on it was described as being helpful.

Decor: furniture and antiques

Contents of rooms and the decor provided residents with information about the purpose of it and made it more distinct. Decoration and objects can therefore assist with the identification of rooms and therefore assist with wayfinding.

Murals and art work

These should be relevant to the residents and allow for reminiscence or tactile interaction. It was noted that participants looked at these as they walked by and they may potentially act as wayfinding cues.

Distinctive features: shop fronts and memory boxes

The shops in F5 were commented on by many of the residents during the walks and in briefing and debriefing sessions. Some of the shops are functional, providing a hairdresser and allowing for reminiscence of older objects on display in the shop front as residents walk past. These types of facilities may be memorable landmarks because of the associated function. Memory boxes may be suitable for some residents but there are some conflicting views on whether these are helpful in assisting residents to identify their own room. These are ideally displayed at eye level so they can be seen, but this poses a risk as people walk past holding onto the handrail and may bump their head. The notion of recessing these so that they do not protrude from the wall was discussed, but it was a concern that these were no longer obvious and did not serve their purpose. Other issues relate to privacy and the need to protect those who do not wish to have anything personal on display that may identify them as this can be upsetting.

Most people seemed to use their room number as a way of identifying their room rather than looking for their memory box. The implication of this is that distinctive features like the shops can act as landmarks which can be used in wayfinding. There is some uncertainty on the benefits of memory boxes and the use of a door number may be relevant with some complementary images and words.

6.4.3 Personalisation domain

This area considers how space is used and personalised for the individual residents.

Sensory information as a memory trigger

For some people, memory of an activity or smelling food acts as a prompt which helps them to connect memory to places, allowing learning which helps with orientation and wayfinding. This could be memory of baking in a room, a place where they play games, or for one resident they knew a room because it was next to a bathroom where they personally got their dressings on their legs changed. How space is used can result in a memory which can be used as a wayfinding strategy.

Sensitivity to the sensory environment

In contrast to using sensory information as a memory trigger, noise should be controlled as it was observed that loud TVs and alarms can serve as a distraction and can cause disorientation as participants miss wayfinding cues or turns as a result of the noise. It is therefore necessary to reduce and eliminate noise, which is particularly difficult if the TV happens to be placed on a primary circulation route.

6.4.4 Management and care domain

Most of these findings emerged from the interviews with staff or next of kin. This is understandable as the purpose of the wayfinding walks were more focused on establishing factors relating to the design of the physical environment and the impact on wayfinding.

Activities

Activities should be inclusive and cater for individual needs and provide a range of group and one-to-one based tasks. The benefits to residents' wellbeing were widely recognised and the importance of the design of the physical environment was recognised in playing a role in providing facilities for activities.

Social care issues

One of the major reasons for moving into a nursing care home was the need for greater monitoring and specialist, more intensive care. There is often a culture shock associated with the resident moving in. The resident's family may feel an element of guilt and the person with dementia may experience disorientation due to the move which can cause stress and upset. Life stories and a person-centred care approach are currently used to deliver quality care. The design of the physical environment can be supportive in delivering care and assisting monitoring and could be a contributing factor to staff continuity.

Design issues

The environment should be pleasant and welcoming to encourage visitors to call in. This not only concerns the social environment and the ambience of the place, but also the location and design of the building. In order to assist monitoring one home zoned the dependencies of the residents in relation to proximity to staff. This is not ideal as it means moving residents when they require more attention. A compact, centralised plan may be more appropriate to reduce corridors and assist with monitoring.

Wayfinding

In some cases residents were described as not possessing the ability to independently find their way and so relied on the help from others. For those who were independently able to find their way, establishing a routine was noted as important for improving orientation and reduces anxiety once the person had settled in so that they could learn the environment and become familiar with the various routes.

6.5 Summary of design recommendations

Sections 6.2, 6.3 and 6.4 discussed the findings which emerged as a result of interviews, Space Syntax analysis and the wayfinding walks conducted. The remainder of this chapter lists the combined findings which relate to the four domains and explores the implications of these considerations in terms of design.

6.5.1 Design considerations for the architectural domain

Table 6-7 presents a summary of the design considerations. Many of these relate to the architecture domain are complemented by the interior design domain which is summarised in the next sub-section 6.5.2.

Design consideration	Principles	Achieve through
Conceal entrances/exits and areas that are out of bounds.	General design. Promote free movement and avoid frustration.	Layout, organisation and hierarchy of spaces. Level access should also be in place (avoid lifts & stairs).
Avoid dead-ends, locked doors and shifts and kinks in geometry.	General design. Avoid frustration and the appearance that nothing exists beyond that point.	Simplicity in design, creating a compact plan or placing functional and meaningful spaces at the end of corridors.
Garden design and access	General design. Outdoor space should be integral to design in order to fulfil the basic of access.	Consider as part of the overall design concept. Integrate issues relating to the micro-climate to ensure year round access, including shelter and shade.
Avoid long, straight, repetitive corridors which are homogenous.	Causes difficulty with wayfinding. Things look the same so it becomes difficult to identify a particular room.	Avoid these types of corridors of highlight by using landmarks or signage. Compact, centralised plans with smaller, adjacent supportive areas were preferred over corridors.

Discussion and Recommendations

Design consideration	Principles	Achieve through
Avoid symmetry in the plan.	Causes difficulty with wayfinding. Things look the same in all directions, making it difficult to select the correct way.	Create a variety of different spatial experiences in the architecture and avoid isometric view points by providing landmarks and features which stand out.
Avoid junctions	Causes difficulty with wayfinding. Multi-choice and T-junctions cause difficulty due to symmetry. If there is more than one choice the resident may become lost when they choose the wrong way.	Avoiding symmetrical junctions which present the problem of multiple choices. Simplicity in design is fundamental in supporting wayfinding.
Provide internal and external views in the building.	Promotes wayfinding. Assists in orientation by helping to establish one's position to other parts.	Glazed screens and apertures should be in place to key shared spaces which have their purpose clearly defined and are obvious. Windows should direct key views to outside.

Table 6-7: Summary of findings relating to the architectural domain.

6.5.2 Design considerations for the interior design domain

This section identifies features of interior design which should be considered when designing for dementia (Table 6-8).

Design consideration	Principles	Achieve through
Avoid obstructions: furniture positions.	Wayfinding issues. Poor positioning of objects in the architectural layout can restrict movement and determine which direction is chosen to move in.	Consider how the spaces will be used and how this might evolve during the design and layout of the building. The addition of objects and furniture will change how the environment is interacted with.
Signage	Assists with wayfinding. Affirms location of places or directs residents to walk the right way.	Use relevant address names and numbers. Text and images should be used together, along with adequate contrast so that the features of the sign can be read. Signs must be at the right level (not too high) so they are accessible.
Distinctive features and landmarks: decor, furniture, murals, art work and shops.	Assists with wayfinding. Memorable features are used as landmarks to reference during wayfinding.	Designing and incorporating distinctive features or facilities in the homes. Define purpose of space through decor.

Table 6-8: Summary of findings relating to the interior architecture domain.

6.5.3 Design considerations for the personalisation domain

The table below outlines design considerations which should be referred to in order to tailor the physical environment to the individual's needs.

Design consideration	Principles	Achieve through
Sensory information as a memory trigger	Assists with wayfinding. Personal experiences in certain rooms may be recalled and used as part of a wayfinding strategy.	Architectural and interior design features can act as landmarks and assist with wayfinding.
Sensitivity to sensory information	Causes issues. Need to control levels of sensory information as it can cause agitation and confusion if there is too much.	Use a minimal colour palette to distinguish tonal differences between walls, floors and handrails. Reduce noise.

Table 6-9: Summary of findings relating to the personalisation domain.

6.5.4 Design considerations for the management and care domain

The social environment must also be considered in conjunction with the design of the physical environment which should be supportive of one another. Table 6-10 identifies the areas of design which may help to achieve this.

Design consideration	Principles	Achieve through
Should be supportive of activities	General design. Variety of spaces at different scale to support activities at a group and one-to-one level.	Large central areas with smaller adjacent spaces. The purpose of each space should be clearly defined and they should not be multi-purpose as this is confusing.
Should be supportive of monitoring and delivery of care	General design. Enable visual access to all areas of building to provide ease of monitoring. Areas should be spacious and support the delivery of care.	Centralised and compact plan with minimal corridors. Sufficient space and facilities to enable the delivery of care.
Should be supportive of wayfinding	General. Establishing routine can promote wayfinding. When someone has moved into a home and settled in, they should not need to move again as this causes upset.	Design should provide wayfinding cues (landmarks, signage) and avoid symmetry, corridors, obstructions and junctions.

Table 6-10: Summary of findings relating to the management and care domain.

6.6 Conclusion: design recommendations that promote wayfinding

The listed considerations in Section 6.5 replicate some already established design recommendations. The focus is for a design that promotes wayfinding for those with dementia by considering interior design and the architectural domain. It was important to list features which are affected by personalisation (how the space is used or experienced by the individual) and issues relating to management and care. Within the results, there were some aspects specific to wayfinding which are new and emerging considerations for design for dementia. These are highlighted and detailed in Chapter 7.

Some important issues which need to be reiterated are the need for a person-centred care and a supportive social care environment. Some considerations which were raised during interviews were the lack of expertise shown in dementia specific design. This is an issue which is difficult to overcome, however it does suggest there needs to be a greater awareness made to designers of the potential of the design of the physical environment for people with dementia. This does not necessarily need to be through design regulations but through training and continuing professional development, similar to those who undertake sustainability design certificates.

Site selection and planning issues must be thoroughly examined as this determines the supportive infrastructure available in terms of local services, including bus routes, primary care and local shops for instance. Particular to Northern Ireland, the area in which the care home is placed must be equitable to all and not polarised to one community.

Another factor relating to wayfinding is how individual perception is, so it is difficult to know what is being experienced, especially since it is also regarded as instinctual. The wayfinding walks offered an opportunity to provide a better understanding of the wayfinding experience of care home residents with dementia and gave them a chance to relay information if they were capable of doing so. In some cases there may be an incapacity for wayfinding so that a person may need to rely on others to go to and from places. The signs and symbols of the physical environment relate to affordances and how people interact and respond to their surroundings. This is significant to the design recommendations which were identified in this chapter as they are intended to improve wayfinding experience by eliminating issues and improving areas of the environment regarded as promoting wayfinding.

6.7 Summary

This chapter discussed the collective findings from the fieldwork which involved the use of mixed methods, including semi-structured interviews with staff and next of kin and wayfinding tasks with briefing and debriefing feedback. Space Syntax was used to analyse the legibility of space using VGA and to predict patterns of movement using avatar based simulation. The implication of participants having dementia meant that these Space Syntax techniques were sometimes conflicting when compared to the reality of the wayfinding tasks. The VGA in particular could be read as an inverse, that is to say that where red or warm tones are seen on the spectral graph usually means that there is good visibility. However, for someone with dementia this usually means a multiple decision point junction, causing confusion and difficulty with wayfinding. This anomaly also means that an alternative avatar could be developed and programmed to more accurately predict how people with dementia would experience the physical environment.

This chapter provided the synthesis of results which could be used as considerations or a framework for architects to use when designing for dementia. The findings were arranged into four domains which were as follows:

- Architectural domain.
- Interior architecture domain.
- Personalisation domain.
- Management and care domain.

The next chapter brings the thesis to a close with conclusions, implications and an overview of the research conducted.

Chapter 7: Conclusion

7.1 Introduction

This chapter provides a summary of the various aspects of the research, including the review of literature on ageing, cognitive impairment and the effects of the design of the physical environment on dementia, the interviews, wayfinding walks and the subsequent synthesis of design considerations. It provides detail on how these relate to improvement of the design of nursing and residential homes in terms of wayfinding for people with dementia. The contribution to knowledge in the fields of architectural research and practice are highlighted. The chapter then concludes by contemplating how the research could be pursued and disseminated in the future to ensure a practical application.

7.2 Background

A comprehensive literature review investigated a number of interrelated fields linked to the research and this produced findings from which the focus and outcomes of the research were derived. The literature review investigated the impact of the ageing population and the associated increased risk of cognitive decline and in particular dementia. This then examined the role of architecture and the design of the physical environment which has the potential to create a supportive realm and provide a more holistic approach to caring for people with dementia. One common problem which is associated with dementia even in the early onset of the symptoms is the reduced wayfinding ability experienced. This issue is particularly troublesome in larger scale and unfamiliar settings, such as the urban or outdoor environment and in long term care settings.

The ageing process presents challenges which architects need to respond to in order to produce successful design. The design of the physical environment can compensate for physical, sensory and cognitive impairments. Physical impairments, including strength and mobility issues are addressed within legislation, such as building regulations and are concerned mainly with issues of access and anthropometrics. Other issues commonly associated with ageing are sensory impairments (including loss of vision and hearing) and cognitive decline, including the onset of dementias. These are often neglected areas of design which can fail those who experience sensory or cognitive impairments. Maintaining dignity through the design of the physical environment is integral in promoting independence, wellbeing and quality of life.

Conclusion

It was recognised that there must be a holistic approach to caring for people with dementia and that the physical environment must be supportive of the care or social environment. The role of the physical environment was therefore recognised as imperative in supporting people with dementia.

Wayfinding difficulties have been recorded as one of the common persistent problems which occur in the earliest stages of dementia. Spatial problem solving and orientation within space may become more of an issue in larger scale or unfamiliar settings. Other age-related impairments may be coupled with dementia, such as visual or auditory decline. This can lead to greater perceptual distortion. People with dementia are particularly sensitive to their surroundings and are less able to deal with environmental stress, which adds to the significance of design specific to issues experienced. Affordances are relevant to wayfinding as the design, layout, decor and objects can offer semantic clues about a space.

In response to criticism from O'Malley and Croucher (2005) regarding previous research, the potential of qualitative research was highlighted. This was deemed to provide a better understanding through employing evidence-based research, ideally directly involving people with dementia in the research to provide the opportunity to offer their perspectives. The value of involving people with dementia in research is widely recognised in providing greater research evidence (Smith et al, 2004). Notably work conducted by Marquardt (2011) identified the need to examine the architectural floor plan as this has been overlooked and will have a direct impact on the spatial experience due to the layout and configuration of space. There was a general consensus that research regarding design for dementia has only really come to the fore in recent years, with research interest growing in the 1980s (Calkins, 2009, Fleming et al, 2011). As a consequence there are limitations surrounding past research as it is either not considered extensive, conclusive, or is anecdotal and many of the benefits are not yet known or recorded (Evans, 2003; Parker et al, 2004). With all of these factors considered, aims and objectives were developed which were the focus of the research.

7.3 Aims and objectives

The aim of this thesis was to provide an understanding of how the architectural design of long term care settings can create a supportive physical environment for people with dementia by promoting independent wayfinding. The subsequent aim was to create a more legible physical environment for residents with dementia, improving the experience for occupants, including residents, staff and visitors.

The objectives of the research were therefore as follows:

- To identify and explore the extent to which current thought and design tools assist architects in designing for people with dementia.
- To develop a research design that incorporates relevant methods to enable people with dementia to participate directly in the research.
- To establish design features of the physical environment that positively or negatively impact wayfinding success for residents with dementia.
- To propose considerations for the design of long term care facilities which architects can reference to help to improve the design of the physical environment, in particular to enhance spatial orientation and the wayfinding experience with a view to promoting the quality of life of the occupants.

7.4 Methodology

The literature review provided a starting point in the thesis which identified the gap in the knowledge on specific design guidance for dementia for architects. The role of the physical environment was widely regarded as beneficial for people with dementia. However this realm was often overlooked, denying a holistic approach to dementia care. The requirement for further research on the topic of design for dementia in long term care settings was therefore identified and in response to the literature review, the need to investigate design for dementia which promotes wayfinding was established.

A triangulation was selected to provide a range of qualitative and quantitative approaches which would enable different perspectives to be revealed. The research design was developed in response to the literature review and other issues including ethical approval and practical issues were influential. This successfully enabled people with dementia to engage in the research as active participants, who gave a valuable first-hand contribution. Ethnographic methods were identified as appropriate to record behaviour and responses of participants of the wayfinding walks who have dementia. Semi-structured interviews with staff and next of kin supplemented and complemented the data from the wayfinding walks. Space Syntax methods were also used, namely VGA and avatar based analysis as a comparison to the recorded wayfinding walks and to analyse the physical properties of the space. Space Syntax can predict the effect the physical properties of space will have on the inhabitants but is not fully immersive so it was complementary to the observations and interviews. The combination of methods was an effective means of revealing layers of data and providing a greater understanding of the thesis topic.

Limitations

This process was not devoid of challenges as the limitations of the project included finite resources, including time scale, available skill set and available resources, such as equipment and funding. Seeking ethical approval from the school research ethics committee and ORECNI were time-consuming. However upon reflectance, strengthened the research design methodology and placed an emphasis on rigour in this research.. The main limitations relate to the selection of the homes to provide a range of plan typologies and the recruitment of people with dementia who would participate in the study.

From an experimental perspective, the fieldwork was conducted in the naturalistic settings of the selected four case studies. This made it difficult to control issues relating to the generation of a homogenous and comparable group of people with dementia. This was despite defining criteria for selection which was used by the staff in the nursing or residential homes when identifying suitable participants for the wayfinding tasks.

Linked to this limitation is the fact that the study is confined to those who were able to participate in the study. The findings have been generalised and relate to the four long term care settings and those involved in the study. Typologies and route types were used to determine the four fieldwork sites, although it is recognised that social and care factors may alter the overall environmental experience for the person with dementia. This study has involved people with dementia who had the capacity and ability to be involved in the wayfinding tasks, therefore it is acknowledged that this applies to a specific section of the wider population of people with dementia.

The four case studies will not cover all spatial configurations (these did not include the L, T or single circuit plans). These were selected with the intention to cover a range of the main route types. This is particularly relevant when considering F4 where only one participant was recruited. This was due to the residents being unable to participate because they were either physically unable or their dementia impaired their ability to understand and consent for the wayfinding tasks. Although F4 was a linear type plan, some fieldwork conducted in F2 and F5 used similar linear routes when for example units within these buildings had been separated. The Y (F2) and circuit shape (F5) routes effectively became linear and the results from these were comparable to F4. Therefore, F4 was not standalone as the effect of a linear type plan was reflected in the findings in the other fieldwork sites. If this had not been the case, another linear type home would have been identified as another potential case study site for further exploration.

7.4.1 Overview of ageing and cognitive impairment

The literature review was initially intended as determining the need for the research, but this was revisited and updated throughout the thesis to correspond with emerging findings which should be considered with the new results from the thesis. The subject of ageing set the context for the thesis and defined the need for the research. It initially examined the implications of a growing ageing population and focused on how the ageing process poses design challenges. Physical impairment is common with ageing and is addressed in legislation such as building regulations. Sensory and cognitive impairment are also more likely in older age, however these issues have been overlooked in the design of the physical environment. The condition of dementia is known primarily to cause memory problems, but it also creates problems in a number of other ways as it impairs spatial and temporal orientation and visuo-spatial perception. This can exacerbate any physical impairment the person with dementia may have and can intensify the sense of confusion if it is coupled with any sensory impairment (such as sight or hearing loss). The design of the physical environment was therefore identified as playing a significant role in creating a therapeutic realm which provides a more holistic and supportive care setting.

7.4.2 Overview of the design of the physical environment for people with dementia and the effect on wayfinding

In response to the acknowledgement of the need to provide a supportive physical environment which complements the social care model, it was necessary to investigate the role of design for dementia further. This revealed the issue of wayfinding which becomes problematic even in the early stages of the disease due to the perception problems experienced. Wayfinding is particularly challenging in larger scale or less familiar environments such as long term care settings like nursing or residential homes. The review on design for dementia revealed that there were some existing design guidelines for architects but many of these were not conclusive and required further investigation. This explored the negative associations of providing guidelines for design which can lead to environmental determinism and discourage creative responses to specific design projects. With regards to this, architectural design was regarded as overlooked since there were a limited number of studies which examined the layout or spatial organisation of the architectural plan. Affordances and how the physical environment is perceived by the senses were identified as important factors in design for dementia. The need to investigate wayfinding for people with dementia living in long term care settings was established as a result of the literature review.

7.4.3 Overview of ethical approval, critique and peer review

An ongoing process throughout the PhD has been academic and peer review. Seminars, reviews and conferences within the university and outside provided a diverse platform for critique, discussion and consideration. Notably a rigorous ethical review both within the school and to ORECNI required the development of a research design and protocol which sensitively considered relevant issues. Part of this required a written peer review to take place after ethical approval was granted from the school's research ethics committee.

This considered the originality and significance of the research, the knowledge and understanding of the topic, the research design, skills and resources available and value for money. The purpose of this was to obtain sponsorship from the University's Research Governance for the application to ORECNI. Following this submission, a meeting and round table discussion took place with the ORECNI panel members regarding the research project. This offered further advice regarding the research design and the ethical implications. A favourable decision was made by ORECNI which permitted fieldwork to commence.

The research has been received positively on a number of occasions with the recognition that there are opportunities for collaboration and incentives for the completed work. The research has an immediate application within architectural practice. It also contributes to architectural theory by extending the knowledge and understanding of design for dementia in long terms care settings, with a specific focus on improving the wayfinding experience. There is a viable outlet to extend the research and develop it in a variety of ways. The following discussion considers how this may occur.

7.4.4 Overview of research design: piloting and ethical considerations

The research design aspired to include participants with dementia as an outlet for recording their first hand experiences and provide a better understanding of how they experience the physical environment. This was influential in designing the methodology and considering the research protocol. Also significant was the pragmatic epistemology which supported a mixed methods approach and was reflexive and considerate of ethical and practical issues. The research problem was informed by the literature review and this also was used to select relevant methodologies. Qualitative and specifically ethnographic methods were identified as suitable to effectively involve people with dementia in the research and elicit their responses. In-depth semi-structured interviews with staff and next of kin were selected in addition to a wayfinding task. VGA and avatar based analysis were used

to analyse and predict how the space would be used and identify potential areas where wayfinding may be problematic. These Space Syntax methods were also used as a comparison and to verify the reality of the recorded wayfinding tasks.

In order to finalise the research protocol, trials with young healthy adults were conducted in the David Keir Building which involved a wayfinding task. This enabled the identification of technological, ethical, data collection and analysis issues. In response to this, equipment and behavioural mapping sheets were altered to make the process smoother for the researcher and participant. Researcher skills were developed during this and the pilot phase which occurred in a non-dementia sheltered accommodation for older people. Interview questions were also piloted and were determined with reference to the research gaps and research questions. Four homes were selected after visits, Space Syntax analysis and considering the joint DSDC and QUB survey which returned 54 responses. These provided a range of design typologies which would determine different route types and a setting where the fieldwork would be conducted.

7.4.5 Overview of interviews with staff and next of kin

In-depth semi-structured interviews were conducted with staff and next of kin associated with the home and people with dementia who participated in the wayfinding tasks. A total of eight staff and 11 next of kin were interviewed and questions covered a range of issues, including the effect of the design of the physical environment on dementia, social activities and how the layout and design affects wayfinding ability. Interviews were analysed thematically to interpret and understand the phenomenon under study.

This iterative process involved coding the interview transcripts from which overarching global themes eventually emerged. NVivo was used as a tool for coding and organising themes following the manual process of reading the text and writing notes. The relevance to the research questions were considered throughout this and thematic networks were also created to establish connections between the expressed ideas. Identified themes which emerged from both types of interview were the same and included: activities, management and care issues, design issues and wayfinding issues. While the defined themes were the same in both cases, they revealed different information which was often complementary.

Under the theme of **activities**, staff felt they had a significant role in ensuring that activities were delivered frequently and were relevant to the resident, either on a group or individual level. Both staff and next of kin agreed that the physical

Conclusion

environment was important in supporting activities. The design should create a series of rooms for the provision of group and quieter, one-to-one activities. Next of kin reported that it was best to have individual rooms for activities and multi-purpose spaces should be avoided as this can be confusing. Staff thought that access to quality outdoor space was overlooked and this was a missed opportunity even in large rural sites. Related to this, next of kin felt that the layout of the building should promote movement without restricting access to areas as this can be frustrating. Next of kin also place a great emphasis on the benefits of activities in maintaining skills, independence, social life and promoting wellbeing.

Management and care issues raised by both staff and next of kin were the importance of quality care and familiarity with residents. They concurred that the design of the physical environment needed to support care, but needed the social care aspect to be good as well to get the best results. One of the main reasons reported by next of kin for moving in was the need for greater care and monitoring. Staff recognised that the design and layout of the building could help or hinder monitoring. They also discussed the potential of assistive technology in helping to monitor hard to reach areas but reported that there are ethical and privacy issues and explained that some residents are suspicious of it and it may cause them to feel anxious. Both groups believed that a specialist approach to dementia design was needed to complement the specialist person-centred care in response to the increasing number of people with dementia.

With regards to **design**, staff explained that site selection, planning and integration into the surrounding community were important. Next of kin supported this as they felt that services needed to be close by and the home needed to be accessible to encourage visitors. The benefits of good design of the physical environment were noted by both groups. Design flaws were also discussed by staff and next of kin, some of which had been addressed during redecoration or refurbishment. Staff considered that either there were missed opportunities, or that the home was outdated or designed without specific regard to the condition of dementia. Some design issues included the lack or imbalance of facilities within the units, the need to increase levels of lighting, removing patterns and improving contrast between walls and floors.

Conclusion

Choice of flooring was discussed, although carpet was sometimes considered more comfortable and homely, flooring like linoleum was preferred as it is easier to maintain, clean and for residents to mobilise safely on. Ground floor and level access throughout were also regarded as imperative for people with dementia as it improves accessibility and avoids the confusion of stairs or lifts. Staff believed it was important to consider the stages of care in design and allow for residents to ideally live in the same place without disruption. An important issue which was raised was the design challenge for the future to meet expectations of a younger clientele. This may require the provision of more facilities, including gyms and increasing space standards rather than providing one small bedroom with an en-suite bathroom.

The discussion around the theme entitled “**Wayfinding**” heard both parties explain that the architectural layout should be simple and centralised. It was suggested that this could be achieved by avoiding junctions and mirroring/symmetry as this requires decision making and can cause confusion, leading to residents becoming lost. This is supported by Marquardt (2011) who posited that there should be no requirement for further learning or higher skills to interpret the layout of care homes and this can be achieved through creating architectural legibility. Interior design and environmental cues were considered to assist with wayfinding and making journeys more memorable or easier to learn. This considered the advantages of internal glazed screens and windows with views which offered glimpses and information about where a person is with reference to other parts. The individual decor and furniture in rooms can help to make spaces more identifiable. Signage was thought to be a more successful environmental cue but it should incorporate an image with the word and be placed at an appropriate height so that it is easy to see.

There was some debate surrounding the effectiveness of colour, primarily because the ageing eye and people with visual impairments find it more difficult to discriminate colours. It was suggested that colour and tonal differences helped to demarcate areas, for instance the toilets have green doors. This suggested the need for traditionally ocular-centric design to appeal to other senses and provide clues about parts of the building rather than relying solely on visual cues. Staff agreed that wayfinding was a common problem and its effects are worsened when a person initially moves in or is stressed. Next of kin were uncertain and found it difficult to decipher whether their associated resident still possessed the skills to successfully find their way independently but believed that establishing a routine can improve it by reducing stress. It was therefore concluded that moving people with dementia is detrimental and should be avoided.

These findings were considered with the results from the wayfinding tasks to establish which features promote or hinder wayfinding for people with dementia in long term care settings.

7.4.6 Overview of wayfinding walks

Selected members of staff were asked to identify residents who would be able to participate in the wayfinding tasks. These members of staff had worked in the home for a sustained period of time and were familiar with the residents on a day-to-day basis. They were given an inclusion criteria defined by the researcher which they were asked to consider when identifying potential participants. As part of the ethical protocol, staff approached residents and their next of kin so as not to feel coerced by the researcher. They were given time to make a decision about whether they wanted to participate. Informed consent was then obtained from the resident and countersigned by their next of kin.

A repeated measures design was used to test the participant's performance over three walks. W1 was led by the researcher and intended to demonstrate the route and provide the opportunity for learning. W2 was conducted on the same day with a break in between with the resident leading the way. The aim of this was to show whether there was any short term memory retained from the participant. The third wayfinding walk was completed one week later, again with the resident leading the way. The purpose of revisiting the walk at a later date was to examine if there was an evidence of learning or long term memory retained.

It was hypothesised that the performance on the walks should improve over time due to learning. Performance on the wayfinding walks was judged based on the following information obtained from the observation of the tasks: number of stops/pauses/hesitations, behaviour, conversation, time taken, distance travelled and average speed compared to the 10m action capability walk test. It was however found that due to the cognitive impairment performance declined across the walks. This was especially true for W3 which was conducted one week later. The performance on W2 was usually poorer than W1, with the exception of a small number of cases which showed irregularity as there was improvement from the first to the second walk. While there may have been some capacity for learning in these cases, it may also be likely that the improvement may be due to concentration on the task and following the researcher's instructions. Other anomalies were seen in two participants on their third walk as they showed improvement from W2.

Conclusion

It was however observed that these participants may have experienced fatigue during W2 as it was conducted on the same day as W1 and both have medical conditions which can affect mobility, such as COPD.

The features of the physical environment which are associated with improving or reducing wayfinding were examined. The observed walks were recorded on a behavioural map which provided details of point on plan (relating to architectural plan), distance travelled, time taken, speed between points, conversation and behavioural effect. Findings were synthesised following the analysis of this data and the associated graph and image from the Vicon Revue cameras. Areas which were considered to be alerts formed the focus of the investigation and may have included triggers such as acceleration, deceleration or issues reported with the recorded behaviour or conversation.

Some common findings were expected such as initial acceleration, deceleration on approach to doors or obstacles, including narrow corridors and acceleration in long sections of corridor. This acceleration may be explained due to the lack of features (which may serve as cues or distractions) present along the repetitive corridor. As a result, these long corridors which are common features in these homes may cause issues with wayfinding as there are no distinct features which assist with this. Netten (1989), Elmståhl et al (1997) and Marquardt and Schmieg (2009) explained how repetitive elements should be avoided and distinct features encouraged to enable differentiation of different parts of the building.

The issue of homogenous corridors were observed on the walks as participants tended to miss wayfinding cues. Kinks and locked doors on corridors caused problems as these appeared as dead-ends. Some of the long corridors were daunting and participants reported physical exhaustion. This can be off-putting and discourage mobility as it may seem “there is nothing down there.” A suggestion from a participant from F2 was that the building should be small and compact in plan because people would be less likely to become lost. Netten (1989) and Marquardt and Schmieg (2009) also felt that small scale was more supportive of wayfinding.

Symmetry or mirroring of the architectural plan was problematic and caused participants to become lost, confused or cross over to the other side. This issue was also reported by next of kin in the interviews who had witnessed this problem. Other layout problems included junctions (T-junctions or corners with accommodation off them).

Conclusion

This is related to symmetry as areas can look the same in both directions and the decision point creates difficulty, so the wrong direction may be easily selected if wayfinding cues are missed. With reference to the literature review, other research conducted by Elmståhl et al (1997), Netten (1989), Marquardt and Schmiege (2009) and Passini et al (1998; 2000) had established that decision points must be simple and act as spatial reference points.

Whilst some knowledge of room numbers was shown during the walks, some participants referred to previous addresses and this caused confusion if they were looking out for that number and it did not match their current address. Feedback on signage was also received during debriefing. This confirmed that people found their room by relating to the signs and room numbers.

One participant indicated signage that was too high up during their walks and claimed that it was hard to read and many people would not be able to see it. The implication of this is that signage will only be effective if it is placed at an appropriate level and it is easy to see.

Other distinctive features that were mentioned as wayfinding cues during debriefing were the furnishings and decor of a room. Some people were able to remember a location based on their sensory memory as they knew where they were because of the smell of baked items or the music that was played in that specific room. The sensory experience may have a role to play for people who have visual impairments. In F5, the shops and gardens were visible when walking around the buildings and these were discussed by the participants in that home as things which stand out and help them find their way.

The provision of glazed screens and windows with views in this home also helped to provide a global knowledge of the building in relation to its parts.

As far as capacity for wayfinding, the observed walks and debriefing sessions presented a challenge with regards to the difficulty of determining whether someone was struggling with the wayfinding task as they would sometimes confabulate to compensate for their inability as a mechanism for concealing this. Many participants admitted that they did not know how they get from one place to the next, or that they relied on others and some explained that wayfinding was simply instinctive and hard to explain. This sentiment was supported by the literature review on wayfinding by Downs and Stea (1973) who discussed whether there was a natural instinct for wayfinding or if it was a learned process.

The wayfinding walks revealed some new knowledge which complemented the information which resulted from the interviews. The interviews with next of kin were completed after the wayfinding walks so as not to influence the researcher and to provide the researcher with the opportunity to ask related questions about the participant's specific experience on the walks. The next step was to consider the implications of the findings from the semi-structured interviews and wayfinding walks.

7.4.7 Overview of design considerations and implications

As a result of the fieldwork findings, design recommendations were organised into four domains, which were:

- Architectural domain
- Interior architecture domain
- Personalisation domain
- Management and care domain

Architectural domain

Under the architectural domain, layout, organisation and hierarchy of spaces should enable free access to all parts of the building without creating staff only or out of bounds areas. Entrances should be concealed and stairs or lifts should be avoided to promote level access movement. Simple, compact plan layouts were recommended and this should avoid locked doors, dead-ends and kinks in corridors. In the case where there are spaces at the end of corridors, these should be meaningful or functional. Garden design and access were commonly overlooked features and it was determined that this should be integral to the overall design concept from the outset and should ensure year round access.

With regards to wayfinding, long, straight, homogenous corridors, symmetry in the architectural plan and junctions all caused problems. This was because they made areas look the same and it was difficult to identify specific areas. Landmarks, signage, distinctive features and more compact, simple architectural plans were considered as solutions to these issues. Internal glazing and external views of interest can assist with wayfinding by helping to establish where a space is in relation to other parts.

Interior architecture domain

Careful consideration of how objects and furniture will fit into the architectural layout is required to avoid troublesome obstructions. The positioning of furniture influences how spaces are used and interacted with. This can also determine which direction is chosen and pose wayfinding issues. Signage with pictures and text which is meaningful and relevant to residents has the potential to improve wayfinding. Similarly, distinctive features and landmarks which may include decor, furniture, murals, art work and shops can help with the identification as they make places more memorable.

Personalisation domain

Sensory information may be used within a wayfinding strategy, but this is unique to the individual memory, perception and experience of the physical environment. Architectural and interior design features can be used as landmarks which trigger this response, acting as wayfinding cues. By considering more of the senses, it is proposed that a more enriched spatial experience will improve wayfinding. People with dementia are particularly sensitive to their surrounding, so it is important to control levels of sensory information, so as not to over-stimulate, or cause agitation or confusion. It was therefore advised that noise levels should be restricted where possible and colour palettes should be limited to provide tonal contrast important in demarcating areas and distinguishing floors from walls and handrails.

Management and care domain

The design of the physical environment should support activities by providing a variety of spaces at different scales to encourage group and quieter individual activities. It was suggested that a large area could be supported by smaller adjacent rooms. Interviewees also suggested that it was best to avoid multi-purpose rooms as these can cause confusion and it was better to have clearly defined rooms which have a distinct purpose.

The architectural layout was considered to have a role in supporting staff with monitoring and delivery of care. Ideally a centralised, compact plan was preferred as this was viewed as improving visual access to areas of the building. The literature supports direct visual access as it can benefit people with dementia by providing clear cues and lead to social spaces within the building (Marquardt, 2011; Marquardt and Schmieg, 2009; Passini et al, 1998; 2000). Space standards and facilities, such as stores and sluice rooms should be sufficient as this can improve the delivery of care to the residents.

Establishing routine can promote independence and wayfinding ability. It was also considered important in reducing stress and anxiety which can lead to confusion and have a negative impact on the wellbeing and quality of life of residents. Many of the findings from the interviews complemented and reinforced those from the wayfinding walks. This provided a triangulation and helped to confirm or challenge some of the findings. The implication of this research is discussed in the next section of this chapter.

7.5 Contributions

The research conducted for this thesis was intended to contribute to knowledge which would be beneficial to both architectural theory and practice.

7.5.1 Contributions to architectural theory

The literature review contributed to architectural research by examining the link between ageing and cognitive impairment and how dementia alters the perception of the physical environment. There is emphasis on the need to provide for what is now an ageing demographic, with dementia emerging as one of the major challenges. Dementia is more commonly associated with memory loss, but it also causes problems with wayfinding, so difficulties are encountered in the physical environment. This is particularly prominent on a larger scale, such as the urban environment and also when a person is moved from a small scale domestic home familiar to them, to a nursing or residential care home due to the need for greater safety, care, or monitoring. This identified gaps with architecture, suggesting that countries are ill-equipped in terms of housing options and design for people with dementia (Hirano et al, 2011). Where there has been a considerable focus on physical impairment, issues relating to cognitive and sensory impairment have been neglected. A lack of focus on these issues means that these have been overlooked in term of design.

The role of the physical environment is now widely recognised in supporting people with cognitive decline, such as dementia (Powell Lawton, 1996; Brawley, 1997; Day et al, 2000; Bonneyfoy, 2007). It can improve quality of life and even encourage regular visits from friends and family (Evans, 2003; Gnaedinger et al, 2007). Maintaining independence and liberties are important for the person with dementia and part of this connects to the ability to successfully find their way.

Conclusion

Research had been conducted in this field with some landmark studies establishing principles for promoting wayfinding in design for dementia (Netten, 1989; Elmståhl et al, 1997; Passini et al, 1998; 2000; Marquardt and Schmieg, 2009; Marquardt, 2011). It was then established that very few of these had examined the architectural plan in terms of building structure or layout. In addition to this, while it was appreciated that there were some thorough design recommendations and guidelines for dementia, particularly those developed by Stirling University and the DSDC (Cunningham et al, 2008), there is still some criticism regarding methodological issues and a lack of empirical evidence surrounding some of these. This tremendous gap prompted the foundations for which this research would fulfil.

It was established that research on people with dementia often relies on the people surrounding them, such as carers and professionals due to the ethical issues, including continued informed consent, communication and how the process was thought to be time-consuming (Barnes, 2002; Brawley, 2005). O'Malley and Croucher (2005) identified that qualitative research has a greater potential to provide a better understanding of how people with dementia are influenced by the effects of the physical environment. Anthropological or ethnographic methods were incorporated as part of the research design to directly involve people with dementia in the study as part of evidence-based research is to provide an understanding of their lived experience and document the social processes involved in wayfinding in these care settings (Denzin, 1978; Angrosino, 2007).

The design of the wayfinding walks included behavioural mapping which recorded distance, time and speed, position on plan, conversation and behavioural responses. This was coupled with semi-structured interviews with staff from the care homes and the resident's next of kin who provided additional or complementary information.

The outcome of this research has been the generation of design considerations which are primarily focused on wayfinding, although, some do have other benefits to areas such as management and care and social activities. Some of the considerations discussed in Chapter 6 are linked to existing recommendations and concur with current knowledge. Moreover, novel and original findings have been indicated which provide further guidance for creating a supportive environment for wayfinding for people with dementia.

Some significant design features include creating simplicity in the architectural plan by avoiding symmetry or mirroring, reducing the number of multiple choice junctions, particularly those which are symmetrical like T-junctions. Internal and external views were also determined to be important as they provide allocentric information for building users who can locate themselves in relation to other parts.

Glazed screens and focused views through windows to the outside were therefore deemed to be vital. Connected to this is the need to make the function of areas and rooms obvious. Making the function of rooms obvious by displaying their function or meaning was encouraged in the literature (Netten, 1989; Passini et al, 1998; 2000; Marquardt and Schmieg, 2009; Marquardt, 2011). This can be achieved through semiotics and symbolism, using decor, furnishings, items, personal belongings and signage. Making rooms distinct helps create a unique identity and this alongside associated sensory material can assist in creating landmarks or a memory of place.

The challenge with colour is that due to age related visual impairment it is likely that this will not be relevant to many residents. Recommendations based on colour are therefore not relevant to all as some may not be able to distinguish specific hues.

This research is timely and relevant as it confirms existing knowledge on design for dementia and proposes evidence for new considerations which are intended to improve wayfinding. The combination of using methods relating to different disciplines helped to provide an inter-disciplinary insight. This is essential for architecture as there is often detachment between how social processes alter the designer's originally intended use of space. This PhD thesis engaged directly with people with dementia and has reaffirmed existing knowledge and established new design considerations for improving wayfinding in nursing and residential care homes. These principles are beneficial for architectural research and practice.

7.5.2 Contributions to architectural practice

This thesis conducted research which has a practical application to architectural practice. This research used a combination of architectural theory and examined current design guidance for dementia in the UK. The apparent lack of specialist knowledge of design for dementia combined with the immense need for a responsive physical environment that provides a supportive and holistic approach to dementia care confirmed the need for this research. The research endeavours to connect the architectural theory to architectural practice as the potential benefit of the physical environment for people with dementia needs to be realised in order to create a more successful architecture that responds to specific needs.

Conclusion

The value of the research lies in the fact that an evidence-based research model was followed which enabled direct engagement with residents who have dementia in the long term care settings. This provided an insight from the rich data that was collected and enabled them to act as valuable contributors to the research. The study is timely since there is an emphasis on the need for more research into dementia. This is ever more relevant with the recent announcement from the UK Government (2013) who have pledged to double the funding into dementia research by 2025. Dementia research is still considered to be in the relatively early stages with greater interest occurring from the 1980s onwards (Fleming et al, 2011). In order for this to be of practical application within the UK architectural community, relevant current design guidelines for dementia were examined. There is a lack of connection between design practice and research which poses a challenge.

Since many of the dementia design recommendations are not legislative, for instance within building control, there is no obligation for a need to know or implement these as a minimum standard. There is a danger whereby if these type of design guidelines were to become regulation that a mediocre architect would merely treat these precisely as a checklist and a tick-box exercise. It is perhaps more suitable to treat these as design considerations which would allow for a thought process to occur and consider these specifically for each project and site. Design prototypes may develop from this accordingly.

Through the dissemination of this research and other complementary design guidelines, a greater awareness may be raised for architects who are designing for people with sensory and cognitive impairments, which are both common implications of dementia. Although the research was based within the context of Northern Ireland, the principles are transferrable on an international level. Since the primary concern with the research was on wayfinding for people with dementia, this has a wider application. For instance the same principles may apply when considering the design of complex buildings which are notoriously difficult for wayfinding, for instance territories that are unfamiliar to visitors at hospitals and airports.

7.5.3 Addressing the gaps

This work was informed and influenced primarily by research by Netten (1989), Elmståhl et al (1997), Passini et al (1998; 2000), Marquardt and Schmiege (2009). Similarly, they examined the influence of architectural layouts in long term care settings on people with dementia. The research incorporated the categorisation of floor plans as used by Elmståhl et al (1997) and Marquardt and Schmiege (2009).

Conclusion

It expands on the work of Passini et al (2000) who only involved a single site nursing home on one occasion only. The aspect of the architectural floor plan shape and design configuration was therefore considered in the selection of homes in the study. Consequently, a Y-shape, a H-shape, a linear and a circuit type plan were selected as fieldwork sites.

This research intended to address the gaps of Netten (1989); Elmståhl et al (1997) and Marquardt and Schmeig (2009) who relied on staff rating the performance of the residents with dementia.

It has contributed and extended current knowledge on the design guidelines on wayfinding for dementia. The DSDC design guidelines are thorough and address some issues relating to wayfinding. However, these focus on aspects relating to contrast between floors and walls and signage. This research has addressed issues relating to the spatial arrangement, architectural floor plan and identified issues relating to other areas including architecture, interior design, personalisation and management and care.

To overcome their shortcomings it used observed wayfinding walks, similar to those conducted by Passini et al (1998; 2000) and Mitchell et al (2003) were used as these were more suitable methods to involve people with dementia. The research design involved the development of a novel approach to investigating the problems of wayfinding encountered by the people with dementia. It elaborates on the existing work by using a repeated measures design to examine the individual's performance over time and incorporates other analytical methods including architectural computing tools (Space Syntax methodologies). This has an application to other design typologies and user groups but can first and foremost be used as an effective means in engaging people with dementia in research.

It builds upon existing knowledge and the design guidelines proposed as a result of research by Netten (1989); Elmståhl et al (1997); Passini et al (1998; 2000); Marquardt and Schmieig (2009). Additionally, it complements the thorough set of design guidelines proposed by DSDC and Stirling University. New findings relating to wayfinding for people dementia have been found, for instance the difficulty experienced with symmetry in plans and the effect of multiple decision points.

The findings from the research relate to wayfinding but should be read within a holistic approach to design by recognising the social and care environments. This is evident in the organisation of the four domains: architectural domain, interior architecture domain, personalisation domain and management and care domain.

7.5.4 Concluding summary

In conclusion the thesis has contributed to the body of research on design for dementia in the following ways:

- The review of literature identified gaps in knowledge and indicated that architectural design for people with dementia has been ill-considered in terms of wayfinding which is a common persistent problem in the early stages of the disease.
- A research design was developed that involved appropriate methodologies which was in response to the need for evidence-based research, enabling the participation of people with dementia in the research. This also effectively involved staff, next of kin and people with dementia in the research. This includes conducting work comprising of the wayfinding task and the use of architectural computing as viable original methods.
- Original knowledge was identified on wayfinding and design for dementia.
- Design features were determined which promote or reduce wayfinding ability for people with dementia.

7.6 Further research

This section brings the thesis to a close proposing future direction for the research and the dissemination. Further areas of investigation should include assessing the effectiveness of these design considerations in the application of design and the possibility of applying the research methods and outcomes to benefit other user groups or complex building typologies. Some specific features mentioned, such as aspects of interior design will require further testing to determine their effectiveness in assisting wayfinding for people with dementia.

7.6.1 Assess the effectiveness of the design considerations

The design guidelines which emerged as a result of the research should be tested. Ideally this would involve full scale prototypes which incorporate the design considerations. Virtual reality may also be useful in trialling and determining the effectiveness of the design principles. However it should be noted that this still falls short of real-life and some people even find the experience disorientating and difficult. In some instances, cost neutral considerations such as interior design aspects could be applied more easily during refurbishment or redecoration projects. Many of the recommendations need to be implemented at an early stage of design, during stages 0-3 of the RIBA Plan of work (2013).

7.6.2 Application to other user groups and building typologies

The research design and methodologies were successful in providing an understanding of how people with dementia interact with the physical environment and experience wayfinding problems. The results of this research offer solutions which aim to improve wayfinding in long term care homes for residents with dementia. This work may also have an application in large and complex building typologies such as airports, schools, shopping centres or hospitals. The same methodologies may be applied with different user groups and building typologies. The results from this work have a wider scope as Zeisel (2001) explains that design for people with dementia has benefits to others.

7.6.3 Further research on specific aspects of the design considerations

Specific features mentioned within the design considerations require further research. This may include investigating colour and pattern perception and recognition with people who have dementia and other sensory impairments. Colour recognition remains an indeterminate issue with regards to ageing and dementia, as associated visual impairments often make it difficult to decipher individual colours. Tone, patterns and textures may therefore be more relevant for someone who has sensory and cognitive impairments.

7.6.4 Design better green spaces

It became glaringly obvious that gardens and landscape were overlooked in many of the dementia specific long term care settings. This is despite the therapeutic benefits of well designed outdoor and green space being well established. In many cases this is a missed opportunity, particularly on larger rural sites where there has been no regard given to this area. Even on confined sites, some form of green space should be incorporated to offer residents with free accessible outdoor space. The micro-climate is particularly important to consider in this part of the world and should allow access all year round and at different times of the day, providing shelter, shade and sufficient lighting.

7.6.5 Closing remarks

Some of the design considerations appear to be obvious but are easily neglected. These dementia specific care homes require a specialist dementia design to achieve more supportive and better models. The purpose and aspiration of this thesis is to contribute to architectural theory and to have an impact on architectural practice in the realm of design for people with dementia through the use of an innovative approach. It advocates the importance of involving those with dementia to enrich and directly inform the research. The dissemination of these ideas is imperative for the practical application of this design philosophy. It is hoped that through the publication of academic papers and collaboration with the DSDC this will be made possible. The challenge of raising awareness of the importance of specific design for dementia to architects and designers is difficult. The temptation is to encourage it through legislation via the building regulations. However, these should not come across as prescriptive with the caveat of environmental determinism. Rather these should be presented as ideas which the architect and care providers consider within the context of the specific design project and site.

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Appendices